

Changes in the vessel walls can cause the blood to press on the vessel walls with greater force.

Increased blood pressure

Excess fat and cholesterol in coronary artery (atherosclerosis)

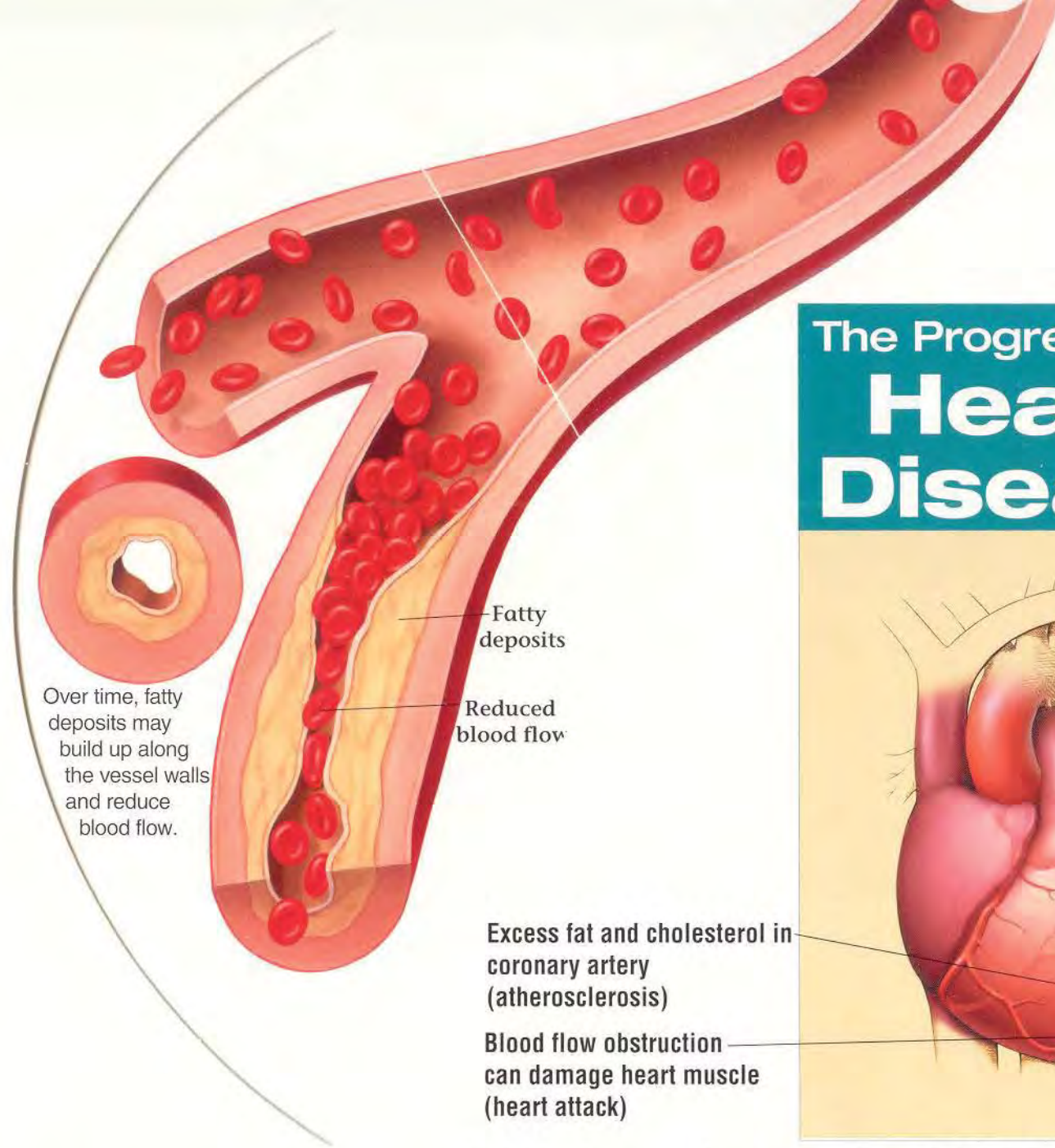
Blood flow obstruction can damage heart muscle (heart attack)

## The Progression of Heart Disease

1. VESSEL NARROWING

Turn the dial to view the progression of heart disease.

High blood pressure often occurs with type 2 diabetes, and both carry an increased risk of heart disease. Over time, high levels of fat and cholesterol in the blood vessels can gradually reduce or block blood flow to the heart.



Over time, fatty deposits may build up along the vessel walls and reduce blood flow.

Fatty deposits  
Reduced blood flow

## The Progression of Heart Disease

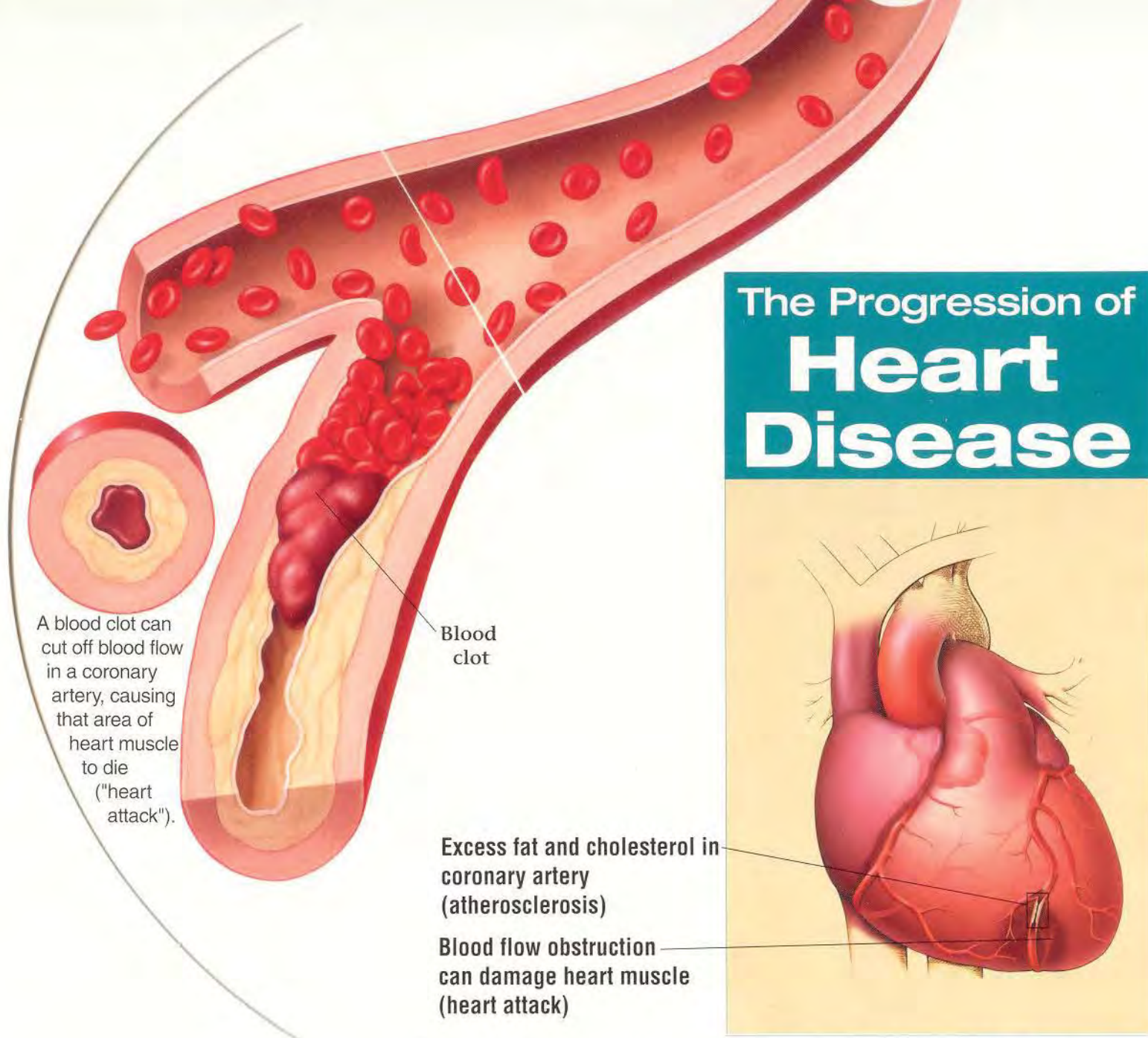
Excess fat and cholesterol in coronary artery (atherosclerosis)  
Blood flow obstruction can damage heart muscle (heart attack)

2. REDUCED BLOOD FLOW

Turn the dial to view the progression of heart disease.

High blood pressure often occurs with type 2 diabetes, and both carry an increased risk of heart disease. Over time, high levels of fat and cholesterol in the blood vessels can gradually reduce or block blood flow to the heart.





3. BLOCKAGE

Turn the dial to view the progression of heart disease.

High blood pressure often occurs with type 2 diabetes, and both carry an increased risk of heart disease. Over time, high levels of fat and cholesterol in the blood vessels can gradually reduce or block blood flow to the heart.

# **Troubled Hearts for Women with Diabetes**

## **Diabetes in women under 60 may quadruple the risk for heart disease**

November 1, 2013

(dailyRx News) In general, women under the age of 60 are less likely than men to get heart disease. Having diabetes, however, can be a game changer, potentially raising a woman's heart disease risk to that of a man.

Diabetes can be hard on the heart. Over time, high blood sugar levels can lead to increased deposits of fatty materials on the insides of the blood vessel walls, which is called atherosclerosis.

While diabetes has been a known heart risk, a new study found that its effects on the hearts of women under the age of 60 may be much greater than previously thought.

The study showed that diabetes substantially raised rates of coronary artery disease among women, and that women with diabetes had similar rates of coronary artery disease as those of men with diabetes.

“Exercise and eat healthily to help prevent heart disease.”

Rita Rastogi Kalyani, MD, an endocrinologist and assistant professor of medicine at the Johns Hopkins University School of Medicine in Baltimore, led this review which looked at three major studies of more than 11,000 men and women who were under the age of 60 and had coronary artery disease (CAD).

The researchers compared CAD in patients in terms of person-years. Person-years is the product of the number of years a population has been affected by a condition and the number of members of a population who have been affected by that condition.

While CAD rates were lower in women than men without diabetes, CAD event rates were similar among both men and women who had diabetes. The rates of CAD for women with diabetes were 17.65, 7.34 and 2.37 per 1,000 person-years for the three studies, respectively, compared with 12.86, 9.71 and 1.83 per 1,000 person-years for the men.

In evaluating just the women, the researchers found that those with diabetes had a four to five times higher CAD rate than those without the disease. Among men, however, diabetes had little or no impact on heart disease risk.

Dr. Kalyani told dailyRx News, “Men in this age group have a high risk of heart disease to begin with and the additional presence of diabetes does not seem to increase the risk of heart disease substantially further.”

As to why women experienced an increased likelihood of heart problems, Dr. Kalyani said that there may be some genetic or hormonal reasons that diabetes affects women differently. Also, men and women may not stick to heart healthy lifestyle behaviors and treatment at similar rates.

“Some other studies have suggested that therapies to prevent heart disease may not be prescribed as frequently in women with diabetes compared to men, but this requires further investigation,” she said.

Because women of any age with diabetes are at high risk of developing diabetes, Dr. Kalyani recommends that all women adopt a heart-healthy diet and lifestyle.

“In addition,” she told dailyRx News, “women with diabetes should continue to discuss with their healthcare providers ongoing strategies to reduce their risk of developing heart disease as part of their comprehensive treatment plan.”

This study was published on October 31 in the journal *Diabetes Care*.

Conditions:

[Atherosclerosis](#) [Cardiovascular](#) [Type 2 Diabetes](#) [Diabetes](#) [Womens Health](#)

### **Share this story:**

Reviewed by:

[Chris Galloway, M.D.](#)

[Beth Bolt, RPh](#)

Review Date:

November 2, 2013

Citation:

[Diabetes Care, "Gender Differences in Diabetes and Risk of Incident Coronary Artery Disease in Healthy Young and Middle-Aged Adults" Johns Hopkins Medicine, "Women under 60 with diabetes at much greater risk for heart disease"](#)

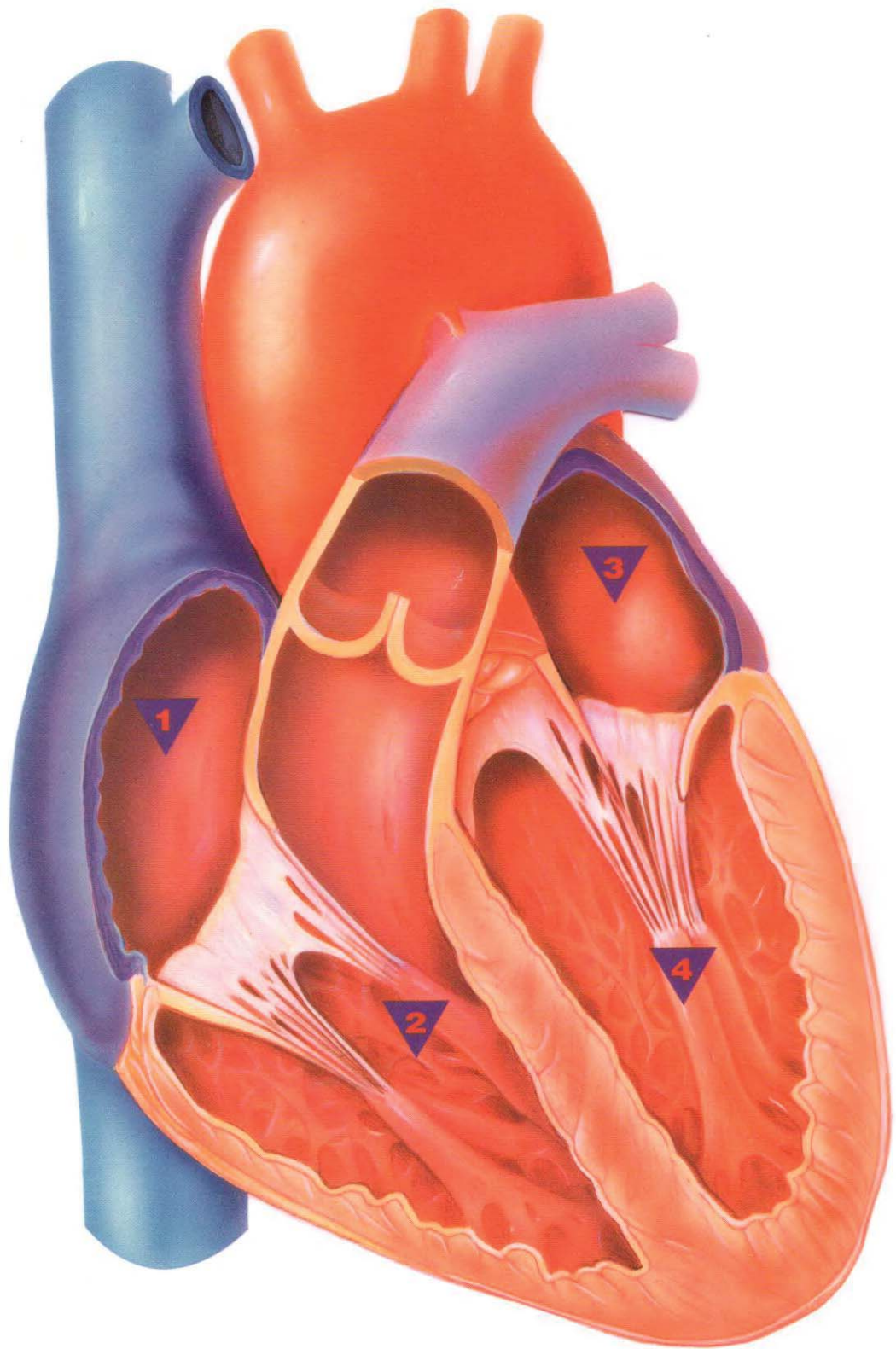
Last Updated:

November 1, 2013

Source:

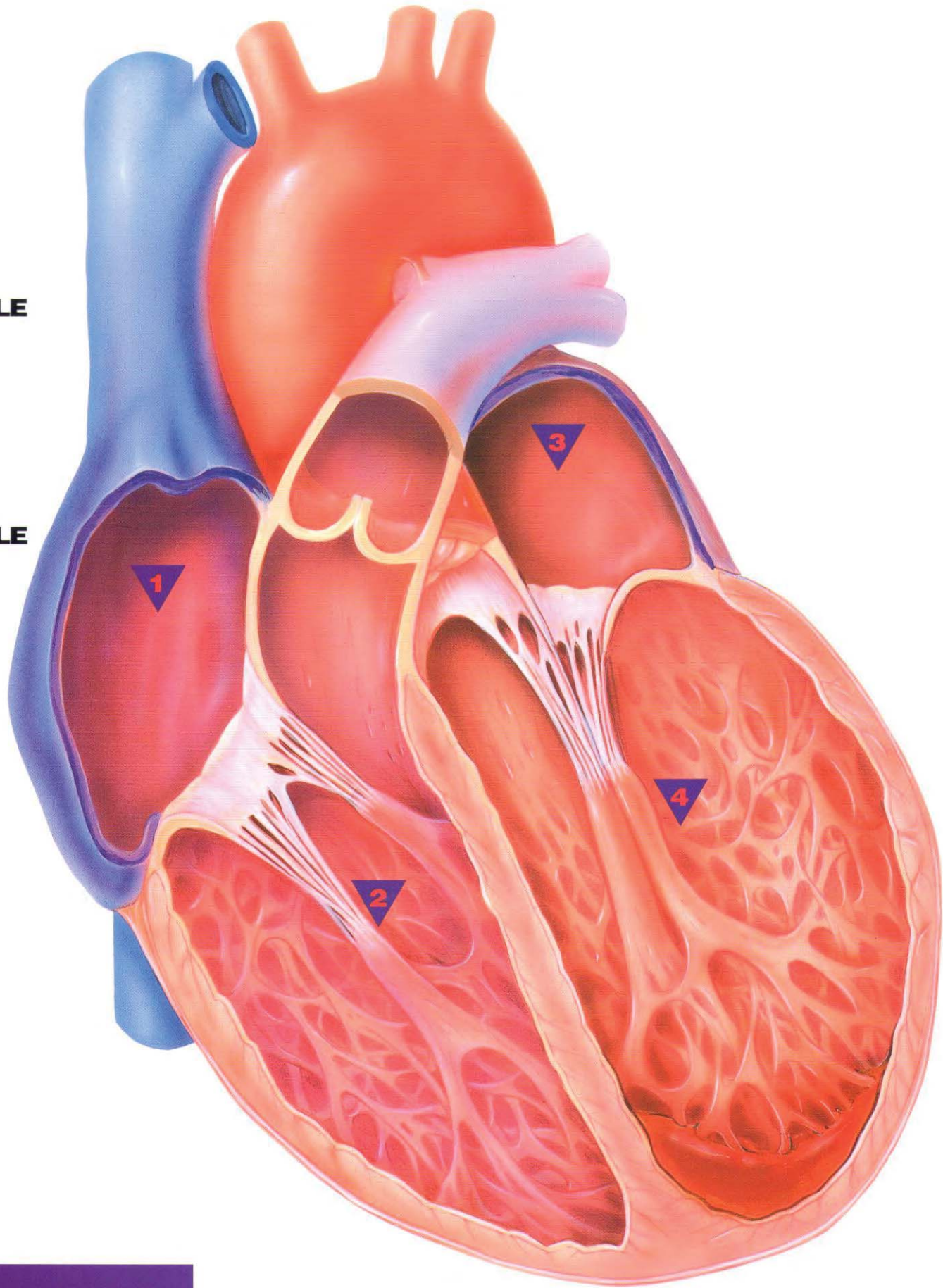
[dailyrx.com](#)





**NORMAL HEART**

- 1. RIGHT ATRIUM
- 2. RIGHT VENTRICLE
- 3. LEFT ATRIUM
- 4. LEFT VENTRICLE



**ABNORMAL HEART**



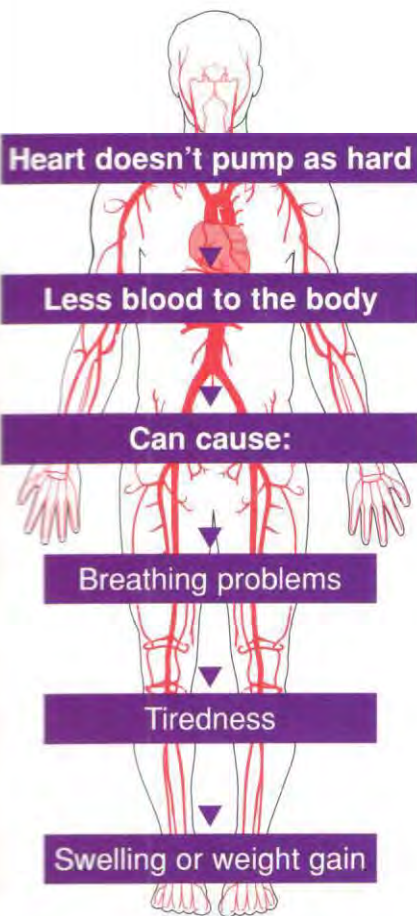
# Understanding the Heart

## HOW THE HEALTHY HEART WORKS

- ▼ Your heart pumps blood to feed your body
  - this blood feeds oxygen to your body, giving it energy
  - this blood also removes waste from your body, and then returns to your heart and starts the process again
- ▼ Normally, the heart pumps 5 to 6 quarts of blood per minute during rest, and more than 20 quarts during exercise

## THE WEAKENED HEART

- ▼ When your heart is weak, the pumping power of each heartbeat is not strong enough to feed oxygen to your body or easily remove waste from it
  - when your body doesn't get enough oxygen, you feel very tired
  - when waste and fluids aren't carried away by blood, your tissues may swell—this is called edema
  - edema can occur in your feet, legs, ankles, stomach, and lungs
  - you may feel tired or short of breath with mild activities. Some patients may feel this way even when they lie down

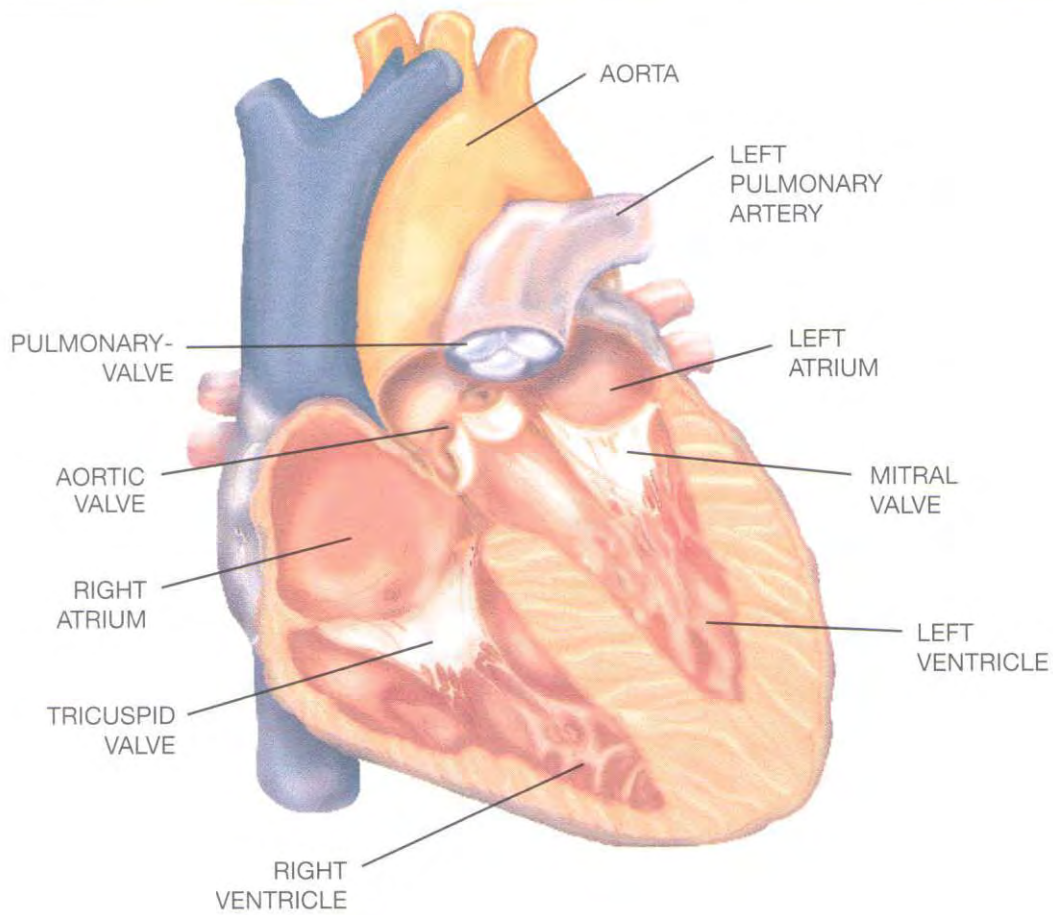




# CARDIAC VALVES

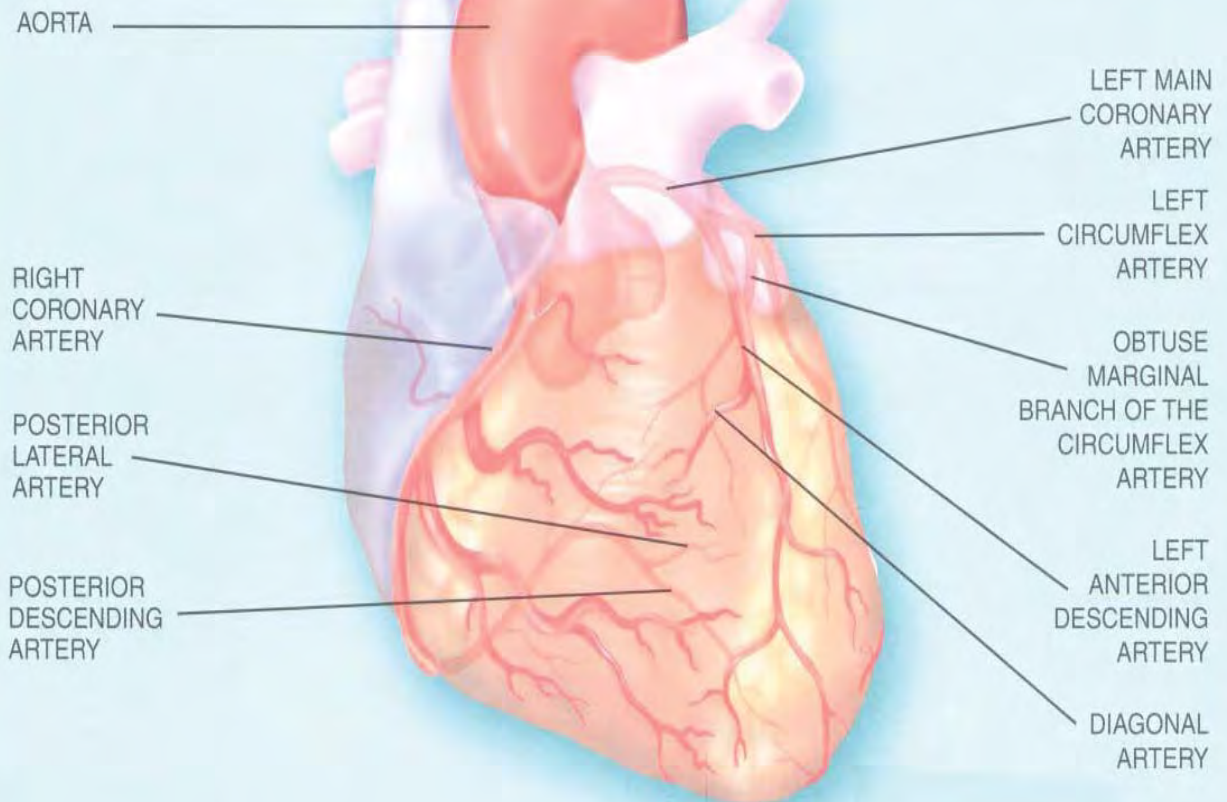
PATIENT'S NAME: \_\_\_\_\_

DATE: \_\_\_\_\_



## Coronary Arteries

AstraZeneca 



The main vessels of the heart come directly from the aorta, where the blood is the freshest with oxygen just back from the lungs. Then these major highways of vessels fill to feed your heart with the oxygen it needs to do its work.

There are also many smaller vessels that come off of these major ones that don't typically show. Think of them as the US 63, Cty T and the gravel paths of the county. They bring fresh blood to many cells in the heart. Persons with diabetes can have trouble with either the major vessels shown or with small vessel disease. Think glucose control, blood pressure control and cholesterol control to help the heart vessels work best.



## What is Stroke?

**Stroke is a disease that affects the arteries leading to and within the brain. It is the No. 4 cause of death and a leading cause of disability in the United States.**

A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain either bursts, ruptures or is blocked by a clot. As a result, the brain cannot get the blood and oxygen it needs and pieces of the brain die.

## Stroke Risk Factors

Approximately 80 percent of strokes can be prevented. Though some stroke risk factors are uncontrollable, such as age and race, other risk factors are in your control and making small lifestyle changes can reduce your stroke risk. For example, hypertension, which is the leading risk factor, can be controlled by eating a healthy diet, regularly physical activity, not smoking, and by taking prescribed medications. The American Heart Association identifies seven factors to control for ideal health. Life's Simple 7: be active, control cholesterol, eat a healthy diet, manage blood pressure, maintain a healthy weight, control blood sugar and don't smoke.

## Types of Stroke



© American Heart Association

An **Ischemic Stroke** occurs when a clot or mass, often a fatty plaque deposit, clogs a blood vessel cutting off the blood flow to brain cells.

Ischemic strokes account for 87 percent of all stroke cases.



© American Heart Association

A **Hemorrhagic Stroke** results from a weakened vessel that ruptures and bleeds into the surrounding brain tissue.

The blood accumulates and forms a bruise within the brain tissue, compressing brain cells and causing them to die.

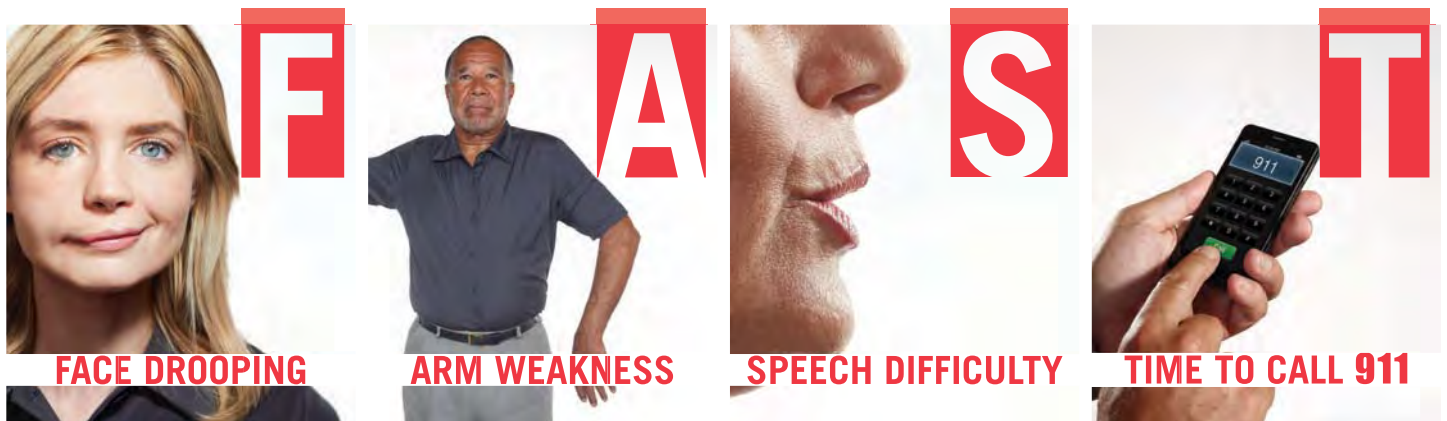


© American Heart Association

A **TIA or Transient Ischemic Attack** produces stroke-like symptoms. A TIA is caused by a clot; but unlike a stroke, the blockage is temporary and usually causes no permanent damage to the brain. TIAs are often called "mini-strokes".

Approximately 15 percent of all strokes occur after a TIA. **A TIA is a medical emergency!**

## Identifying Stroke



**F.A.S.T. is an easy way to remember the sudden signs and symptoms of a stroke. F.A.S.T. is:**

**Face Drooping** Does one side of the face droop or is it numb? Ask the person to smile.

**Arm Weakness** Is one arm weak or numb? Ask the person to raise both arms. Does one arm drift downward?

**Speech Difficulty** Is speech slurred, are they unable to speak, or are they hard to understand? Ask the person to repeat a simple sentence, like "the sky is blue." Is the sentence repeated correctly?

**Time to call 911** If the person shows any of these symptoms, even if the symptoms go away, call 9-1-1 and ensure they are transported to the hospital immediately by ambulance, the fastest way to get medical care.

**Help save a life with the free F.A.S.T. mobile app**



Last year 795,000 people suffered a stroke in the U.S. Be prepared to identify a stroke fast with the free F.A.S.T. mobile app.

You can use it to recognize and respond to the sudden warning signs of stroke and find stroke-certified hospitals near you.

For more information and to download the free F.A.S.T. mobile app, visit [StrokeAssociation.org/WarningSigns](https://www.strokeassociation.org/WarningSigns).



# Your Kidney Test Results



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Chronic Kidney Disease (CKD) Tests	Results	Why It Is Important
<b>Serum Creatinine and Estimated Glomerular Filtration Rate (eGFR)</b>	CKD is an eGFR less than 60	eGFR estimates how well your kidneys are filtering blood. As kidney disease gets worse, the creatinine goes up and the eGFR goes down.
	<b>Your Serum Creatinine Result:</b>	
	<b>Your eGFR Result:</b>	
<b>Urine Albumin-to-Creatinine Ratio (UACR)</b>	CKD is more than 30	Urine albumin checks for kidney damage. The lower the result, the better.
	<b>Your Result:</b>	

Other Important Tests	Results	Why It Is Important
<b>Blood Pressure</b>	Goal:	High blood pressure makes the heart work harder and can damage blood vessels in the kidneys.
	<b>Your Result:</b>	
<b>Serum Albumin</b>	Normal: 3.4 to 5.0*	Albumin is a protein that helps measure how well you are eating.
	<b>Your Result:</b>	
<b>Bicarbonate</b>	Normal: More than 22	Bicarbonate measures the acid level in your blood.
	<b>Your Result:</b>	
<b>Blood Urea Nitrogen (BUN)</b>	Normal: Less than 20	BUN checks how much urea, a waste product, is in your blood.
	<b>Your Result:</b>	
<b>Potassium</b>	Normal: 3.5 to 5.0*	Potassium affects how your nerves and muscles are working. High or low levels can be dangerous.
	<b>Your Result:</b>	
<b>Calcium</b>	Normal: 8.5 to 10.2*	Calcium keeps your bones strong and your heart rhythm steady. CKD can lower the amount of calcium in your bones.
	<b>Your Result:</b>	
<b>Phosphorus</b>	Normal: 2.7 to 4.6*	Phosphorus is important for strong bones and healthy blood vessels. High levels may cause soft bones, hard blood vessels and itchy skin.
	<b>Your Result:</b>	
<b>Parathyroid Hormone (PTH)</b>	Normal: Less than 65	PTH controls the calcium and phosphorus levels in your blood. It is needed to keep bones and blood vessels healthy.
	<b>Your Result:</b>	
<b>Vitamin D</b>	Normal: 20 or more	Vitamin D is important for bones and heart health.
	<b>Your Result:</b>	

\*Normal ranges may vary.

# Your Kidney Test Results

Other Important Tests, continued	Results	Why It Is Important
<b>A1C (for patients with diabetes)</b>	Goal: <b>Your Result:</b>	A1C estimates average blood sugar levels over 2 to 3 months.
<b>Total Cholesterol</b>	Normal: Less than 200 <b>Your Result:</b>	Cholesterol measures the amount of fat in your blood. Too much cholesterol can clog blood vessels or arteries in the heart and kidneys.
<b>HDL Cholesterol</b>	Normal: More than 40 <b>Your Result:</b>	HDL is the good cholesterol and clears bad fats out of your arteries.
<b>LDL Cholesterol</b>	Normal: Less than 100 <b>Your Result:</b>	LDL is the bad cholesterol and can clog your arteries.
<b>Triglycerides</b>	Normal: Less than 150 <b>Your Result:</b>	Triglyceride is a type of fat in the blood.
<b>Hemoglobin (Hgb)</b>	Normal: 12 to 17* <b>Your Result:</b>	Low hemoglobin is a sign of anemia. You may feel tired if you have anemia.

\*Normal ranges may vary.

**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

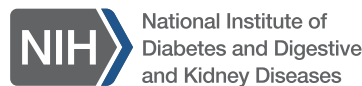
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

For more information, visit [www.nkdep.nih.gov](http://www.nkdep.nih.gov) or call 1-866-4 KIDNEY (1-866-454-3639).

The National Kidney Disease Education Program (NKDEP) encourages people to get tested for kidney disease and educates those with kidney disease and their providers about treatments that can help delay or prevent kidney failure. NKDEP is a program of the National Institutes of Health.

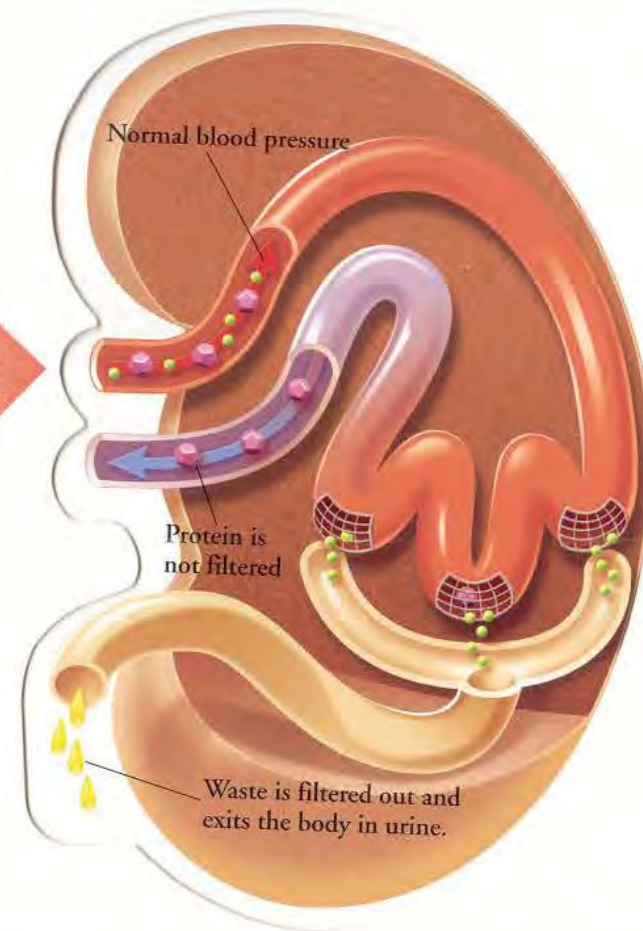






**Tight blood glucose control can help delay or prevent diabetes-related kidney disease and slow the progression.**

Blood carries waste and protein into the kidney.



**1. Normal Kidney**

### 1. Normal Kidney

- Blood carries waste products and useful substances such as protein into the kidneys.
- Waste products squeeze through tiny holes in the filters and exit the body in urine.
- Protein cannot pass through the holes in the filters and stays in the blood.

### 2. Early-Stage Kidney Disease

- Blood pressure through the kidneys increases.
- The increased blood pressure begins to damage the filters.
- Small amounts of protein (albumin) leak into the urine. This is called microalbuminuria

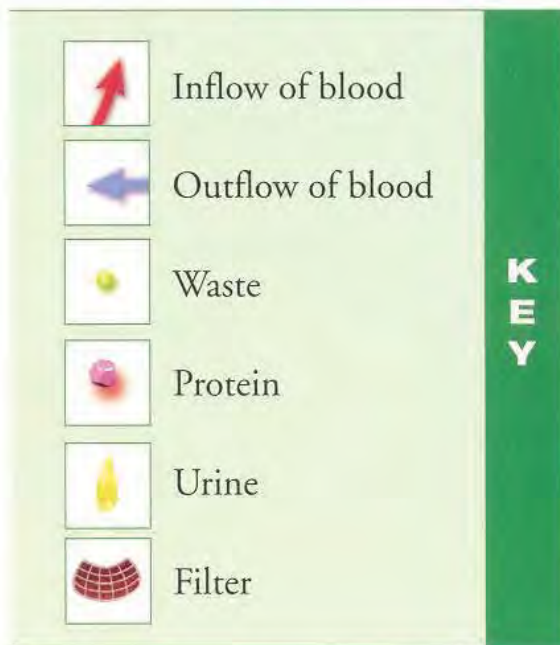
Microalbuminuria can be detected through your annual urine check. At this stage, further progression of kidney disease can be slowed.

### 3. Late-Stage Kidney Disease

- Blood pressure through the kidneys is still high.
- The kidneys lose their ability to filter waste products.
- Waste products start to build up in the blood; large amounts of protein leak into the urine.

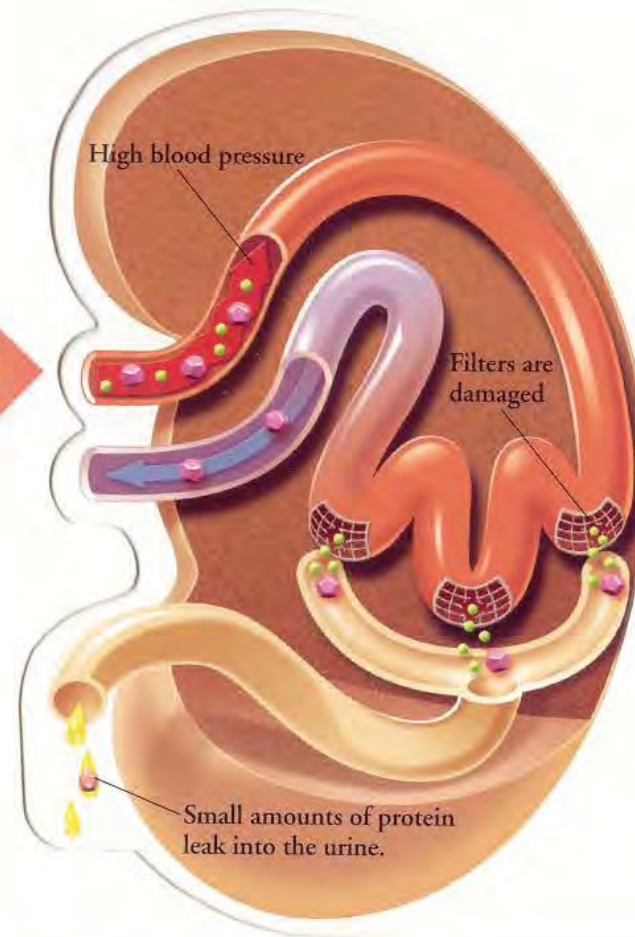
A person with end-stage kidney failure must either have blood filtered by a machine (dialysis) or have a kidney transplant.





**Tight blood glucose control can help delay or prevent diabetes-related kidney disease and slow the progression.**

Blood carries waste and protein into the kidney.



### 1. Normal Kidney

- Blood carries waste products and useful substances such as protein into the kidneys.
- Waste products squeeze through tiny holes in the filters and exit the body in urine.
- Protein cannot pass through the holes in the filters and stays in the blood.

### 2. Early-Stage Kidney Disease

- Blood pressure through the kidneys increases.
- The increased blood pressure begins to damage the filters.
- Small amounts of protein (albumin) leak into the urine. This is called microalbuminuria

Microalbuminuria can be detected through your annual urine check. At this stage, further progression of kidney disease can be slowed.

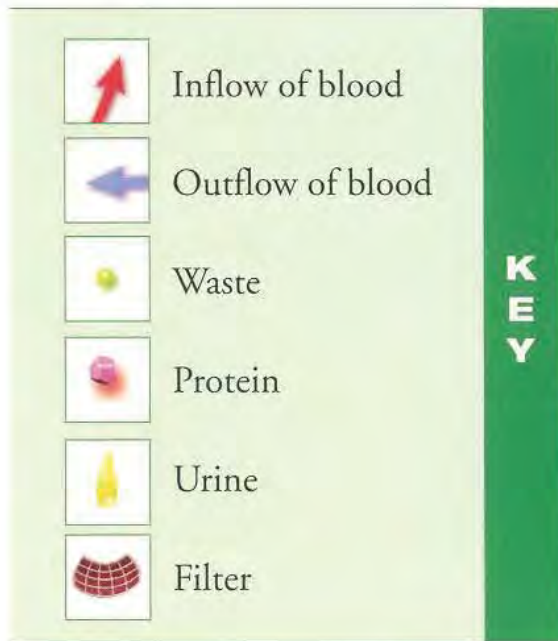
### 3. Late-Stage Kidney Disease

- Blood pressure through the kidneys is still high.
- The kidneys lose their ability to filter waste products.
- Waste products start to build up in the blood; large amounts of protein leak into the urine.

A person with end-stage kidney failure must either have blood filtered by a machine (dialysis) or have a kidney transplant.

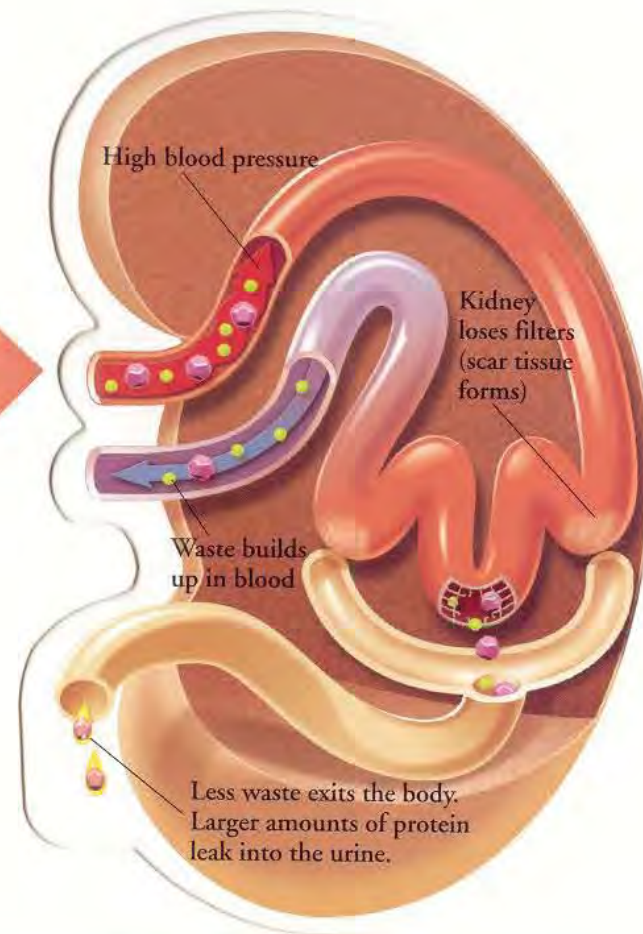
**2. Early-Stage Kidney Disease**





**Tight blood glucose control can help delay or prevent diabetes-related kidney disease and slow the progression.**

Blood carries waste and protein into the kidney.



**3. Late-Stage Kidney Disease**

### 1. Normal Kidney

- Blood carries waste products and useful substances such as protein into the kidneys.
- Waste products squeeze through tiny holes in the filters and exit the body in urine.
- Protein cannot pass through the holes in the filters and stays in the blood.

### 2. Early-Stage Kidney Disease

- Blood pressure through the kidneys increases.
- The increased blood pressure begins to damage the filters.
- Small amounts of protein (albumin) leak into the urine. This is called microalbuminuria

Microalbuminuria can be detected through your annual urine check. At this stage, further progression of kidney disease can be slowed.

### 3. Late-Stage Kidney Disease

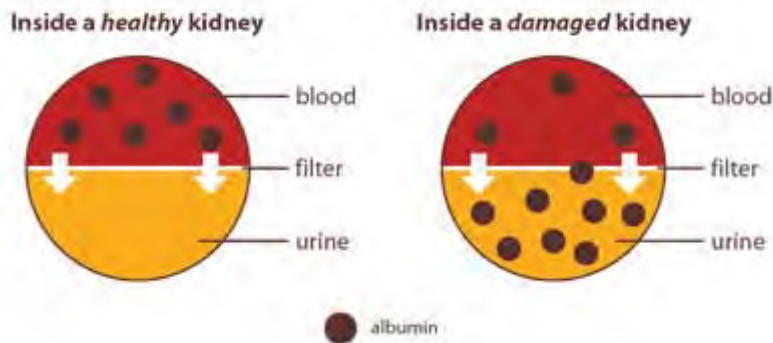
- Blood pressure through the kidneys is still high.
- The kidneys lose their ability to filter waste products.
- Waste products start to build up in the blood; large amounts of protein leak into the urine.

A person with end-stage kidney failure must either have blood filtered by a machine (dialysis) or have a kidney transplant.

# <http://nkdep.nih.gov/learn>

## Understanding Urine Albumin

Albumin (al-BYOO-min) is a protein found in the blood. A healthy kidney does not let albumin pass into the urine. A damaged kidney lets some albumin pass into the urine. The less albumin in your urine, the better.



If you are [at risk for kidney disease](#), your provider should check your urine for albumin along with checking your [GFR](#).

### Testing for Urine Albumin

Your provider may send your urine sample to the lab to see if albumin, a type of protein, is in your urine.

- If you have albumin in your urine, your provider may want to test it one or two more times to confirm the result. Measuring the albumin level in your urine helps your provider know which treatment is best for you.

When your results come back, you may hear terms such as "microalbuminuria," "macroalbuminuria," "urine protein," "proteinuria," "albuminuria," or "urine-to-creatinine ratio," which are all used to describe how much albumin was found.

### Understanding a Urine Albumin Result

- A urine albumin result below 30 is normal.
- A urine albumin result above 30 is abnormal and may mean kidney disease.

In addition to your urine albumin test, your provider should also [check your GFR](#).

If you do not understand your lab results, ask your health care provider to explain them to you.

Please remember that the information on this website should not take the place of talking with your health care provider.

You should also ask your provider what you can do to keep your kidneys healthy.

Learn more about [how to keep your kidneys healthy](#).

# Understanding GFR

GFR stands for glomerular (glow-MAIR-you-lure) filtration rate. A blood test checks your GFR, which tells how well your kidneys are filtering.

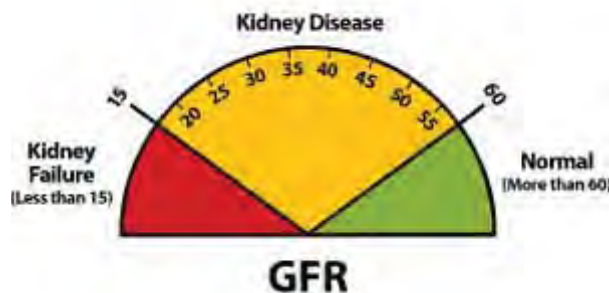
It's important to know your GFR if you are [at risk for kidney disease](#). A [urine test](#) will also be used to check your kidneys.

GFR is reported as a number.

- A **GFR of 60 or higher** is in the normal range.
- A **GFR below 60** may mean you have kidney disease.
- A **GFR of 15 or lower** may mean kidney failure.

You can't raise your GFR, but you can try to keep it from going lower. Learn more about what you can do to [keep your kidneys healthy](#).

The graphic below can help you understand the meaning of your GFR result. Please remember that this information should not take the place of talking with your health care provider.



## If you have a:

**GFR of 60 or higher\*:** Your kidney function is in the normal range. Ask your provider when your GFR should be checked again. You still need to get your [urine checked for kidney damage](#).

*\* If your lab report shows an actual number that is higher than 60, such as 75, 90, 100, consider your result as "60 or higher" and in the normal range.*

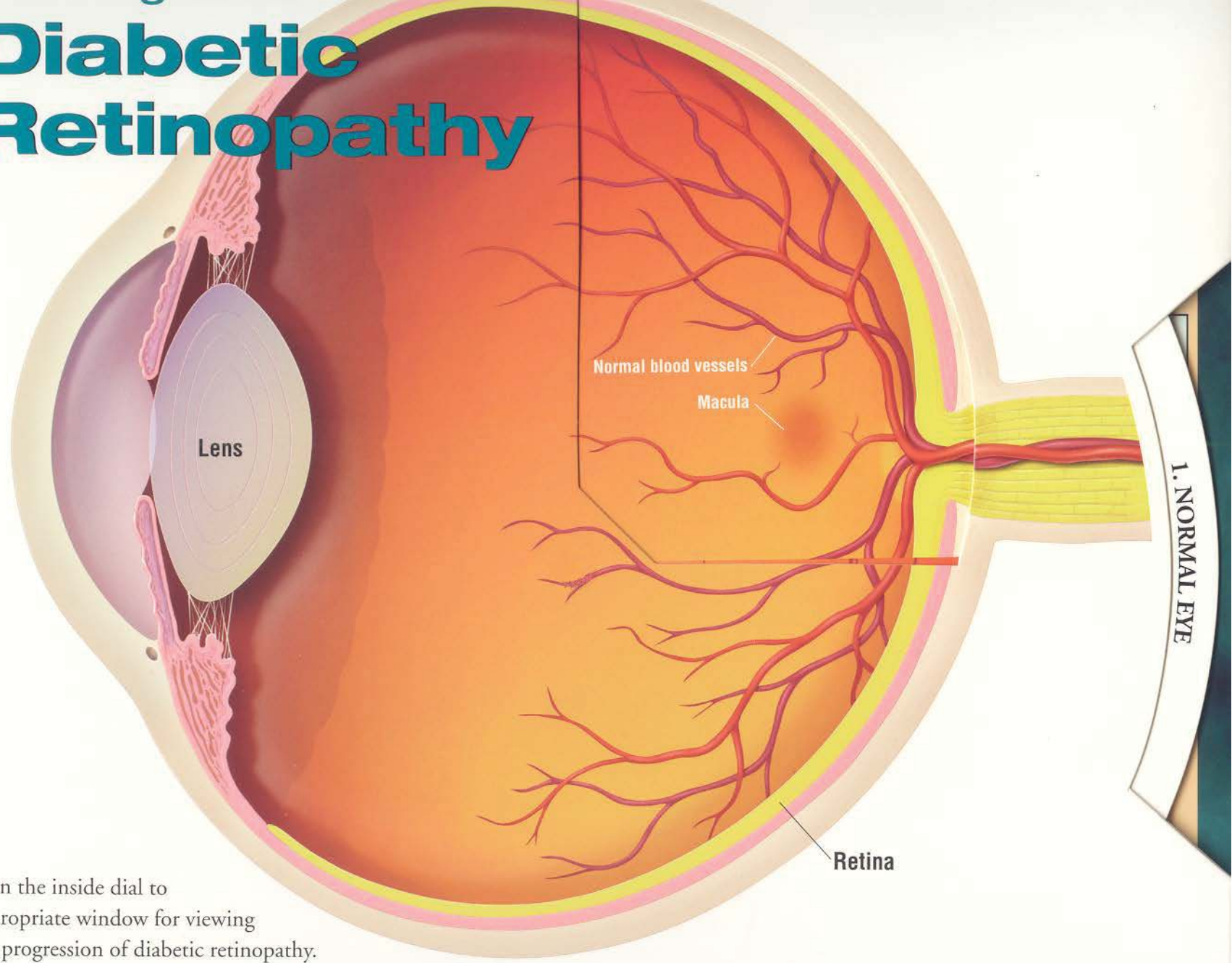
**GFR below 60:** This may mean kidney disease. Talk to your provider about treatment to keep your kidney health at this level. Ask about:

- medicines you should take,
- medicines to stay away from,
- changes to your diet,
- other lifestyle changes,
- whether your kidney disease is likely to get worse,
- ways to treat kidney failure, and
- if you should begin preparing for dialysis.

**GFR of 15 or lower:** This is usually referred to as kidney failure. Most people at this point may need dialysis or a kidney transplant. Talk to your provider about your treatment options.



# Diabetic Retinopathy



Turn the inside dial to appropriate window for viewing the progression of diabetic retinopathy.

1. Normal Visual Field



Slight vision loss may occur ("blurred vision")

2. Macular Edema



Blots in the visual field may occur

3. Proliferative Retinopathy

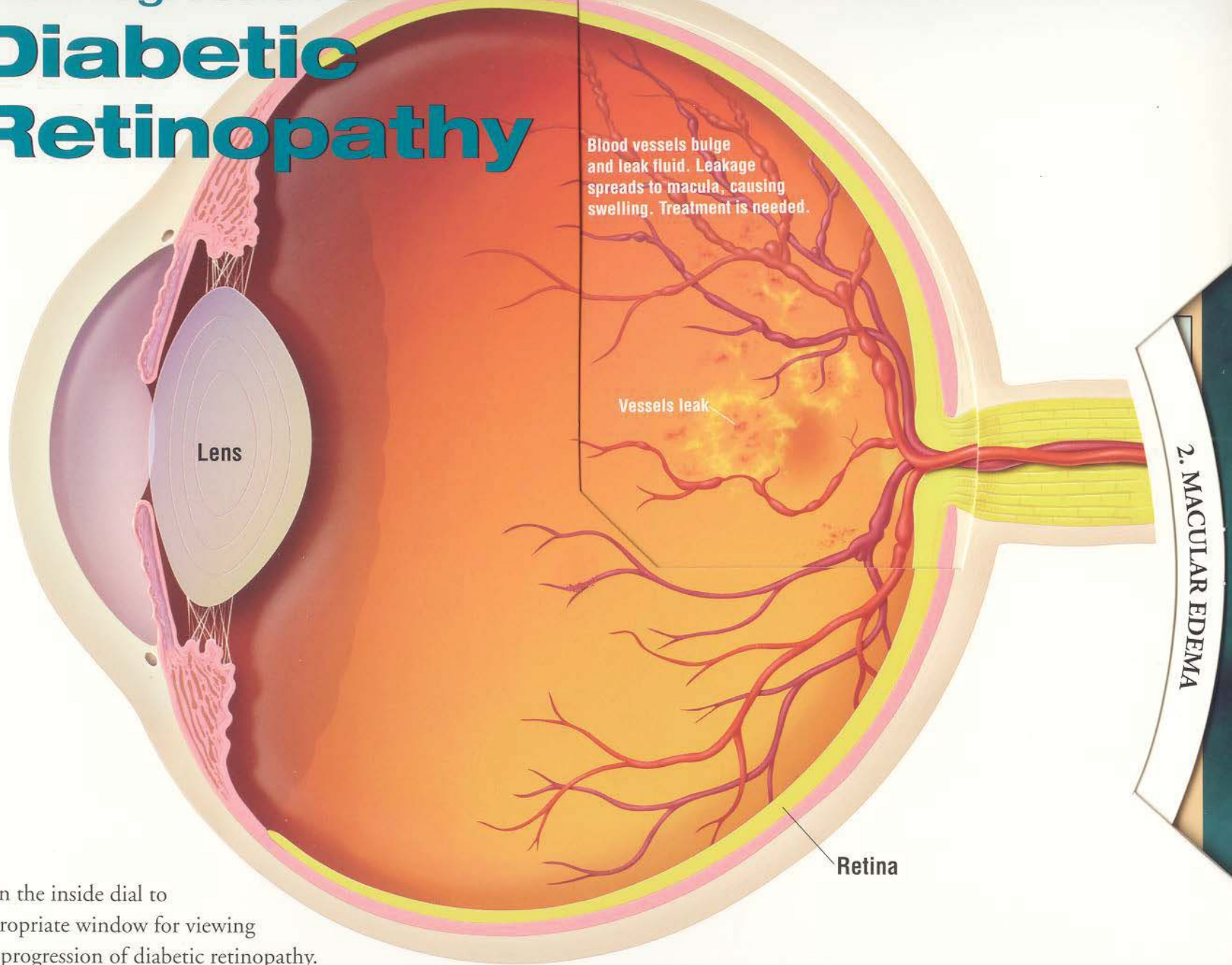


4. Retinal Detachment

Severely reduced vision



# Diabetic Retinopathy



Turn the inside dial to appropriate window for viewing the progression of diabetic retinopathy.

1. Normal Visual Field



Slight vision loss may occur ("blurred vision")

2. Macular Edema



3. Proliferative Retinopathy

Blots in the visual field may occur



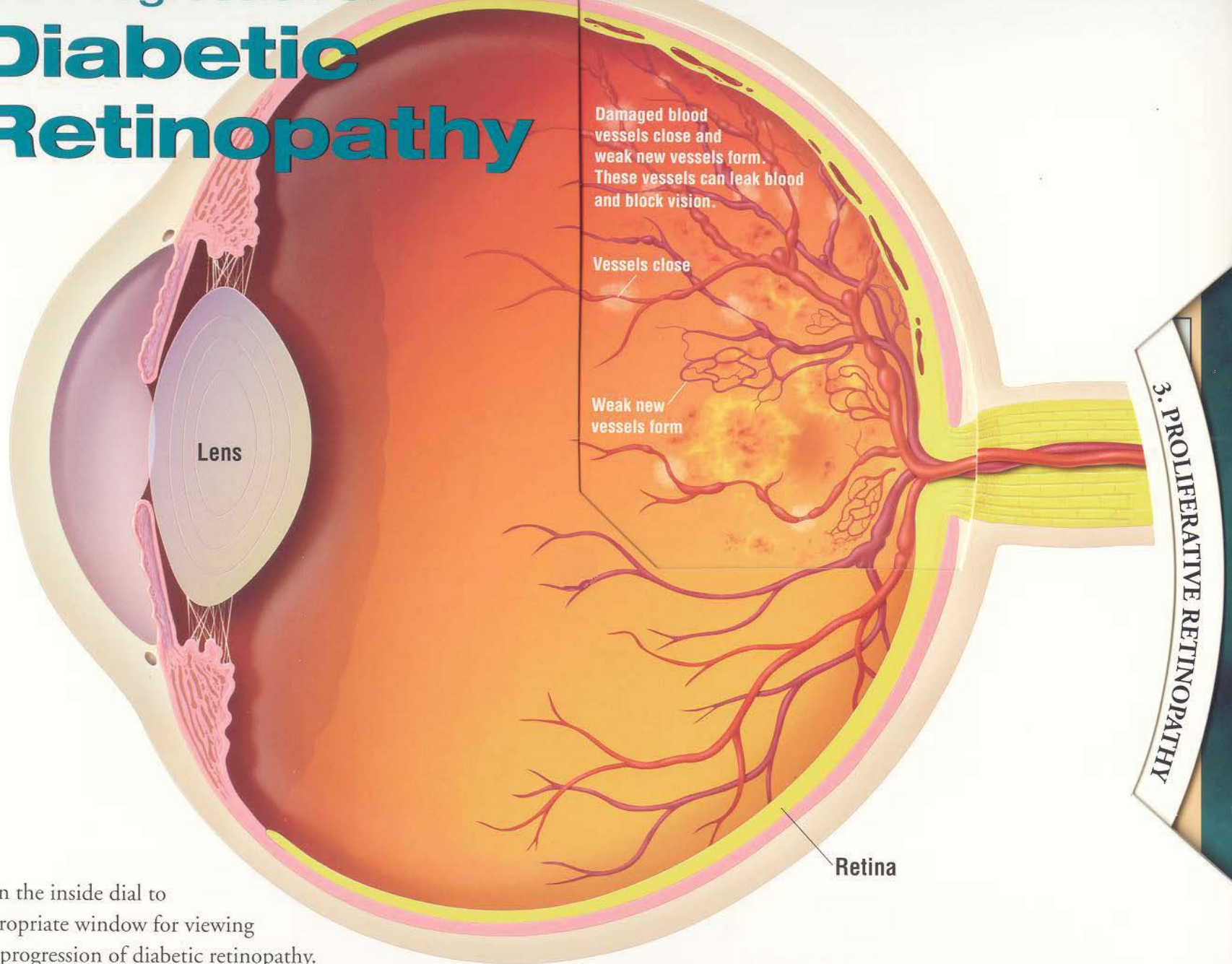
4. Retinal Detachment

Severely reduced vision





# Diabetic Retinopathy



Turn the inside dial to appropriate window for viewing the progression of diabetic retinopathy.

## 1. Normal Visual Field



Slight vision loss may occur ("blurred vision")



## 2. Macular Edema

Blots in the visual field may occur



## 3. Proliferative Retinopathy

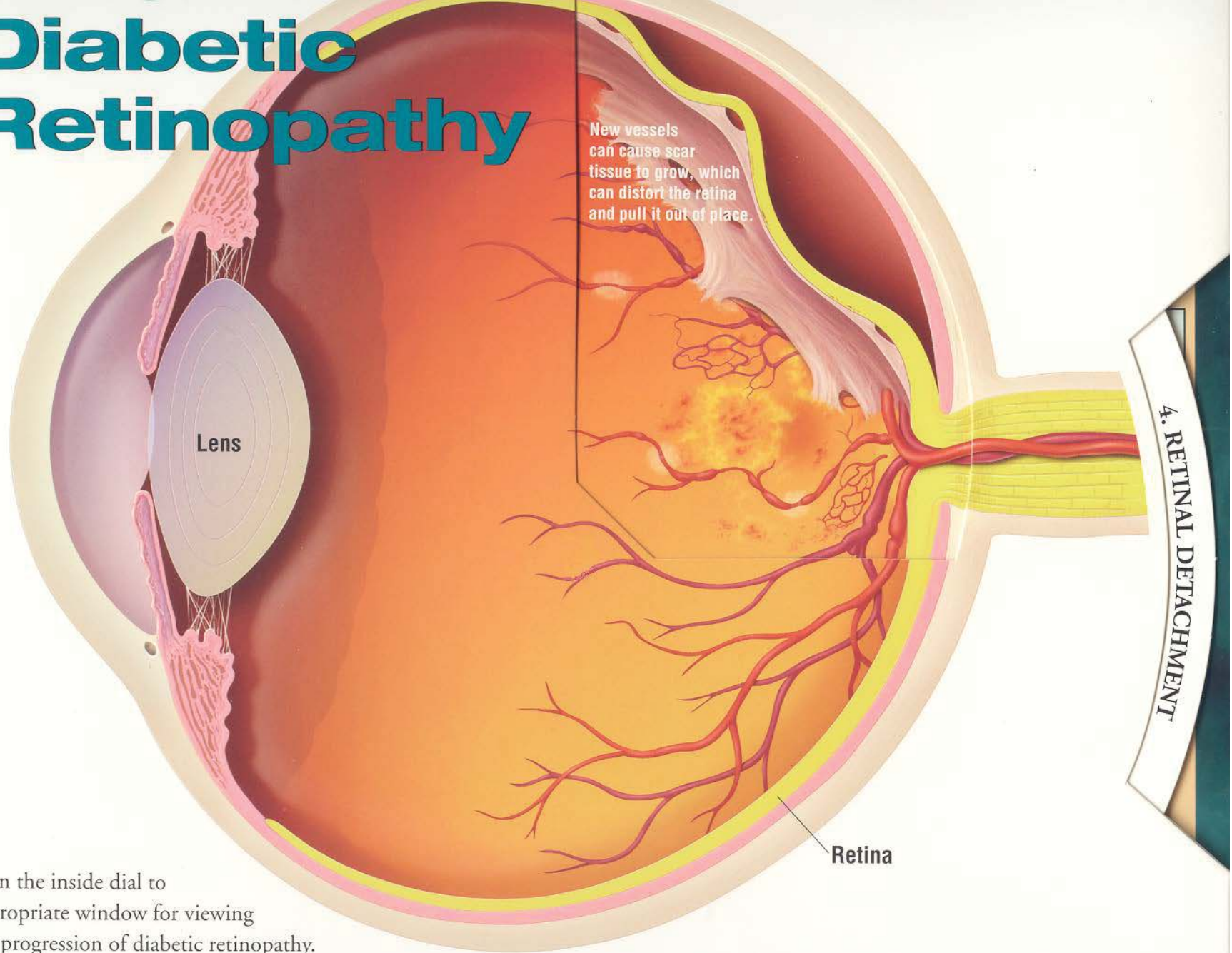
Severely reduced vision



## 4. Retinal Detachment



# Diabetic Retinopathy



Turn the inside dial to appropriate window for viewing the progression of diabetic retinopathy.

## 1. Normal Visual Field



Slight vision loss may occur ("blurred vision")

## 2. Macular Edema



## 3. Proliferative Retinopathy

Blots in the visual field may occur



## 4. Retinal Detachment

Severely reduced vision



# Eye Complications in People with Diabetes

## Stay alert for vision changes — and get screened.

Eye changes in people with diabetes is actually a group of eye conditions that can cause vision loss. It includes the following specific conditions:

- Retinopathy: damage to the blood vessels in the retina, located in the back of the eye.
- Cataract: clouding of the lens of the eye.
- Glaucoma: an increase in the pressure inside the eye that damages the optic nerve and can lead to vision loss.

**Retinopathy** is the most common eye complication. It's also the leading cause of blindness in American adults. The retina is the light-sensitive tissue at the back of the eye, and a healthy retina is required for good vision. Retinopathy causes problems because it leads to the development of new, fragile blood vessels that can leak blood into the center of the eye. Fluids can also leak into the center of the macula, the part of the eye where straight-ahead vision occurs, blurring overall vision.

The longer you've had diabetes, the greater your risk for developing retinopathy. People who keep their blood glucose levels closer to normal are less likely to have retinopathy at all or are likely to have milder forms.

**Cataracts** are common among many people, but people with diabetes are 60 percent more likely to develop this eye condition. They also tend to develop it at an earlier age and have it progress faster. Cataracts cause blocking of light because the eye lenses cloud.

Cataract screening should be part of your comprehensive eye exam. Sunglasses and glare-control lenses may help deal with mild cataracts. Replacement of the lens may be required if the cataract greatly interferes with vision.

**Glaucoma** is more common among people with diabetes than among people without the disease, and risk increases both with the duration of the diabetes and with age. Glaucoma is increased pressure within the eye that results from a closing of the canal that interferes with the flow of fluid from the interior of the eye. This pressure causes damage to the nerve that is critical to good vision, and can cause permanent vision loss. Screening is usually included with a comprehensive eye exam, and there are several treatments available.

### ***The best thing you can do is get screened.***

The American Diabetes Association recommends eye screening soon after a type 2 diabetes diagnosis and within the first three to five years of a diagnosis of type 1 diabetes. Annual screening is recommended thereafter. Screening includes a dilated retinal exam, not just a quick peek in the eyes. A variety of treatments are available, and the sooner treatment is started, the more likely it will be successful.

### ***Prevention is the key to keeping eyes healthy.***

Controlling blood glucose and blood pressure, as well as early and regular eye screening, can all contribute to a bright look on the future.

**Medicare Part B patients:** Call 1-877-231-5199 and mention reference code **ED06500** to order your diabetes testing supplies.

**Web site:** [diabetes.RxSolutions.com](http://diabetes.RxSolutions.com)

#### **References and more information:**

The American Diabetes Association [www.diabetes.org](http://www.diabetes.org)

The National Eye Institute, National Institutes of Health [www.nei.nih.gov](http://www.nei.nih.gov)

Prescription Solutions is an affiliate of United HealthCare Insurance Company.

MSS07-050R 8/07





# Picture Your World

## How could diabetes affect your vision?

All people with diabetes — whether type 1 or type 2 — are at risk for eye problems related to diabetes. Eye problems are more common in people who have had diabetes for a long time and in people who have not always had their diabetes well controlled. Not everyone with diabetes will develop eye problems. That's why it's important to get a dilated eye exam at least once a year.

### NORMAL VISION

How things appear with *normal* vision



### CATARACTS

How might you see the world with *cataracts*?

- Causes cloudy vision
- Develops earlier in people with diabetes
- NOTE: Cloudy vision is also a symptom of elevated blood sugar, which may resolve when blood sugar is controlled



### GLAUCOMA

How might you see the world with *glaucoma*?

- Cuts out peripheral vision
- Causes an increase in fluid pressure inside the eye which results in optic nerve damage and vision loss
- Adults with diabetes are nearly twice as likely to get glaucoma as other adults



### RETINOPATHY

How might you see the world with *retinopathy*?

- May cause limited vision, spots, and blurring
- Usually affects both eyes
- Damages the blood vessels in the retina
- May eventually cause vision loss
- This is the most common eye disease among people with diabetes and is a leading cause of blindness in American adults



**Diabetes Educators:** Call 1-800-635-2288 for information or patient brochures.

**Medicare Part B patients:** Call 1-877-231-5199 and mention reference code **ED06500** to order your diabetes testing supplies.

**Web site:** [diabetes.RxSolutions.com](http://diabetes.RxSolutions.com)





# Your Eyes Are the Windows to Your Health.

Schedule an eye exam today.

## Fact Sheet: Refractive Errors

- More than 11 million Americans have common vision problems that can be corrected with the use of prescriptive eyewear such as glasses or contact lenses.<sup>1</sup> These conditions are known as refractive errors and they occur when the eye doesn't correctly bend, or "refract," light as it enters the eye.
- Common refractive errors include the following:
  - **Nearsightedness** (also called myopia)—A condition where objects up close appear clearly, while objects far away appear blurry. With nearsightedness, light comes to focus in front of the retina instead of on the retina.
  - **Farsightedness** (also called hyperopia)—A common type of refractive error where distant objects may be seen more clearly than objects that are near. However, people experience farsightedness differently. Some people may not notice any problems with their vision, especially when they are young. For people with significant farsightedness, vision can be blurry for objects at any distance, near or far.
  - **Astigmatism**—A condition in which the eye does not focus light evenly onto the retina, the light-sensitive tissue at the back of the eye. This can cause images to appear blurry and stretched out.
  - **Presbyopia**—An age-related condition in which the ability to focus up close becomes more difficult. As the eye ages, the lens can no longer change shape enough to allow the eye to focus close objects clearly.
- Refractive errors are one of the most common—and correctable—causes of visual impairment in the United States. According to a recent study led by the National Eye Institute (NEI), approximately half of all American adults don't have the 20/20 vision physicians consider optimal due to refractive errors.<sup>2</sup>
- Women experience refractive error more frequently than men:
  - Twenty-six percent more women aged 12 and older have uncorrected visual impairment due to refractive error compared with men aged 12 and older.
  - Fourteen percent more women aged 40 and older have refractive errors compared with men aged 40 and older.<sup>3</sup>
- In the United States, in general, people aged 40 and older are the most likely to have refractive errors.<sup>3</sup>



- People aged 12 and older, people with diabetes, Hispanics, and people who are economically disadvantaged have higher rates of visual impairment and can most benefit from corrective lenses.<sup>1</sup>
- Data from the Los Angeles Latino Eye Study (LALES) suggests that the prevalence of visual impairment and blindness is high among urban Latinos aged 40 and older, primarily of Mexican ancestry. The overall prevalence of visual impairment for this population was 3 percent, using study-specific definitions of visual impairment. The rate of impairment and blindness was higher among older and female Latinos.<sup>4</sup>
- Prescription eyeglasses and contact lenses are the most common forms of vision correction. More than 150 million Americans use corrective eyewear, spending more than \$15 billion on eyewear each year.<sup>5</sup>
- Corrective care for refractive errors amounts to an estimated \$3.8 billion to \$7.2 billion annually.<sup>6</sup>
- Refractive surgeries are becoming an increasingly popular option for reducing or eliminating refractive errors.<sup>7,8</sup>
- Sixty-six percent (66%) of adults aged 18 and older report wearing some type of eyewear, including glasses, contact lenses, both glasses and contact lenses, or reading glasses only. Among the adults who report wearing eyewear, more women (72%) report using eyewear than men (60%). Hispanics (46%) report far less use of eyewear compared with Caucasians (70%), Asians (72%), and Blacks (64%). Older adults (94% of adults aged 65 and older) significantly report using eyewear more than younger adults (42% of adults aged 18 to 39).<sup>9</sup>
- Only 42 percent of vision-impaired Americans without health insurance seek medical attention for their eye problems.<sup>10</sup>

## Citations

---

- <sup>1</sup> Vitale, S., Cotch, M. F., & Sperduto, R. D. (2006). Prevalence of visual impairment in the United States. *The Journal of the American Medical Association*, 295(18), 2158–2163.
- <sup>2</sup> Vitale, S., Ellwein, L., Cotch, M. F., Ferris, L. F., & Sperduto, R. (2008). Prevalence of refractive error in the United States, 1999-2004. *Archives of Ophthalmology*, 126(8), 1111–1119.
- <sup>3</sup> National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC) 2002.
- <sup>4</sup> Varma R, Ying-Lai M, Klein R, Azen S; Los Angeles Latino Eye Study Group. Prevalence and risk indicators of visual impairment and blindness in Latinos. The Los Angeles Latino Eye Study. *Ophthalmology* 2004 June; 111(6): 1132–40.
- <sup>5</sup> Kleinstein, R. N., Jones, L. A., Hullett, S., Kwon, S., Lee, R. J., Friedman, N. E., Manny, R. E., Mutti, D. O., Yu, J. A., Zadnik, K. Collaborative Longitudinal Evaluation of Ethnicity and Refractive Error Study Group. Refractive error and ethnicity in children. *Arch Ophthalmol* 2003 August; 121(8): 1141–47.
- <sup>6</sup> Vitale, S., Cotch, M. F., & Sperduto, R. D. Ellwein, L. (2006). Cost of Refractive Correction of Distance vision impairment in the United States. *Ophthalmology*, 113(12), 2163–2170.
- <sup>7</sup> Solomon, K. D., Holzer, M. P., Sandoval, H. P., Vargas, L. G., Werner, L., Vroman, D. T., Kasper, T. J., Apple, D.J. Refractive surgery survey 2001. *J Cataract Refract Surg* 2002 February; 28(2): 346–55.
- <sup>8</sup> Duffey, R. J., Leaming D. U.S. trends in refractive surgery: 2001 International Society of Refractive Surgery Survey. *J Refract Surg* 2002 March–April; 18(2): 185–88.
- <sup>9</sup> National Eye Institute & Lions clubs International Foundation. (2007). *2005 survey of public knowledge, attitudes, and practices related to eye health and disease*. Bethesda, MD: National Eye Institute. Available at: <http://www.nei.nih.gov/nehep/kap/>.
- <sup>10</sup> Zhang, X., Lee, P. P., Thompson, T. J., Sharma, S., Barker, L., Geiss, L. S., et al. (2008). Health insurance coverage and use of eye care services. *Archives of Ophthalmology*, 126(8), 1121–1126.

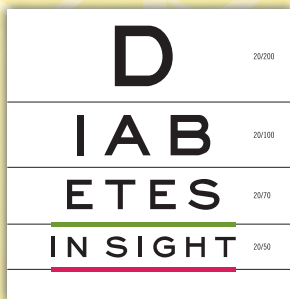


improve outcomes

educate

# Preventing Vision Loss

## from Diabetes



Program developed by:



Program supported by:



Copyright © 2013 by Joslin Diabetes Center ([www.joslin.org](http://www.joslin.org)) and Genentech. All rights reserved.

Joslin Diabetes Center does not endorse products or services, including those of Genentech.

LUC0002014200

# DIABETES IN SIGHT:

## Preventing Vision Loss from Diabetes

### Introduction

Diabetes is the leading cause of vision loss in adults aged 20 to 74. But the good news is that eye problems and vision loss can be greatly reduced. Early care and treatment, starting with yearly retina eye exams, can help preserve vision and prevent loss of vision and eye problems. Encourage and remind your patients to get regular retina exams.

### Using this Flipchart

This flipchart is a tool to help you initiate a conversation and guide discussion with your patients regarding diabetic eye disease and the importance of annual dilated eye exams. The key objectives of this flipchart are:

1. To provide an overview of diabetic eye disease
2. To dispel misconceptions about diabetic eye disease
3. To reinforce the importance of getting an annual dilated (retina) exam
4. To reinforce action steps for lowering the risk for diabetic eye disease
5. To provide a message of urgency, hope and empowerment

Talking points and key messages are provided on the back of each page of this flipchart. Sharing these messages can stimulate discussion and help ensure that you are imparting accurate information and key concepts.

# Fact or Fiction?

- **As long as my diabetes is in good control, I don't need dilated (retina) eye exams every year.**
- **If I don't have any pain or changes in my vision, that means I don't have diabetic eye disease.**
- **Getting my eyes checked for a new pair of glasses "counts" as my dilated eye exam.**
- **People with type 2 diabetes don't get diabetic eye disease.**
- **Since I don't take insulin for my diabetes, I won't get diabetic eye disease.**
- **One of the best ways to prevent vision loss is to have a dilated (retina) eye exam at least once every year.**

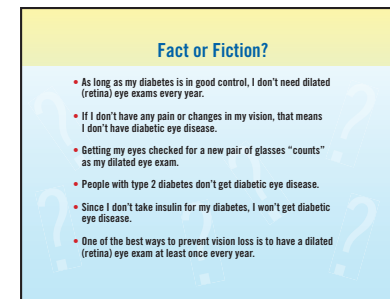


# Fact or Fiction?

Talking about diabetic eye disease and problems with vision can seem frightening. But the more you know about your eyes and how to preserve your vision, the better equipped you will be to take action.

There are many myths and facts around diabetic eye disease. Let's go over some of the common myths that people have. As I read each one, tell me if you think this is TRUE or FALSE.

- **As long as my diabetes is in good control, I don't need dilated (retina) eye exams every year.**
  - **Answer:** False. In order to reduce the chance of vision loss from diabetes, everyone with diabetes (type 1 and type 2) should have a dilated eye exam at least every year.
- **If I don't have any pain or changes in my vision, that means I don't have diabetic eye disease.**
  - **Answer:** False. Often there are no symptoms of diabetic eye disease. Someone can even have severe diabetic retinopathy, a type of eye disease, and still have no symptoms.



- **Getting my eyes checked for a new pair of glasses "counts" as my dilated eye exam.**
  - **Answer:** False. Unless your eyes are dilated, diabetic retinopathy cannot be adequately examined. An undilated eye exam for a new pair of glasses or contact lenses is not the same as a comprehensive dilated exam.
- **People with type 2 diabetes don't get diabetic eye disease.**
  - **Answer:** False. Over time, almost everyone with diabetes, type 1 or type 2, will develop diabetic retinopathy. The good news is that having a yearly dilated eye exam can help detect problems early so that treatment can be given if needed to help prevent vision loss.
- **Since I don't take insulin for my diabetes, I won't get diabetic eye disease.**
  - **Answer:** False. Even if you don't take insulin, you can develop diabetic retinopathy.
- **The best way to prevent vision loss is to have a dilated eye exam at least once every year.**
  - **Answer:** True. Having a yearly dilated (retina) eye exam can help find diabetic eye disease and other eye problems so they can be treated, if needed, before further problems, or even vision loss, occur.

# Preventing Vision Loss from Diabetes

**Lower your risk! Here's how:**

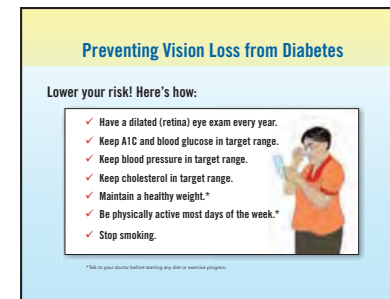
- ✓ **Have a dilated (retina) eye exam every year.**
- ✓ **Keep A1C and blood glucose in target range.**
- ✓ **Keep blood pressure in target range.**
- ✓ **Keep cholesterol in target range.**
- ✓ **Maintain a healthy weight.\***
- ✓ **Be physically active most days of the week.\***
- ✓ **Stop smoking.**



\*Talk to your doctor before starting any diet or exercise program.



# Preventing Vision Loss from Diabetes



Having diabetes puts you at risk for diabetic eye disease. That's because blood glucose levels that stay too high for too long can increase your risk of certain types of eye problems such as diabetic retinopathy, diabetic macular edema, glaucoma and cataracts.

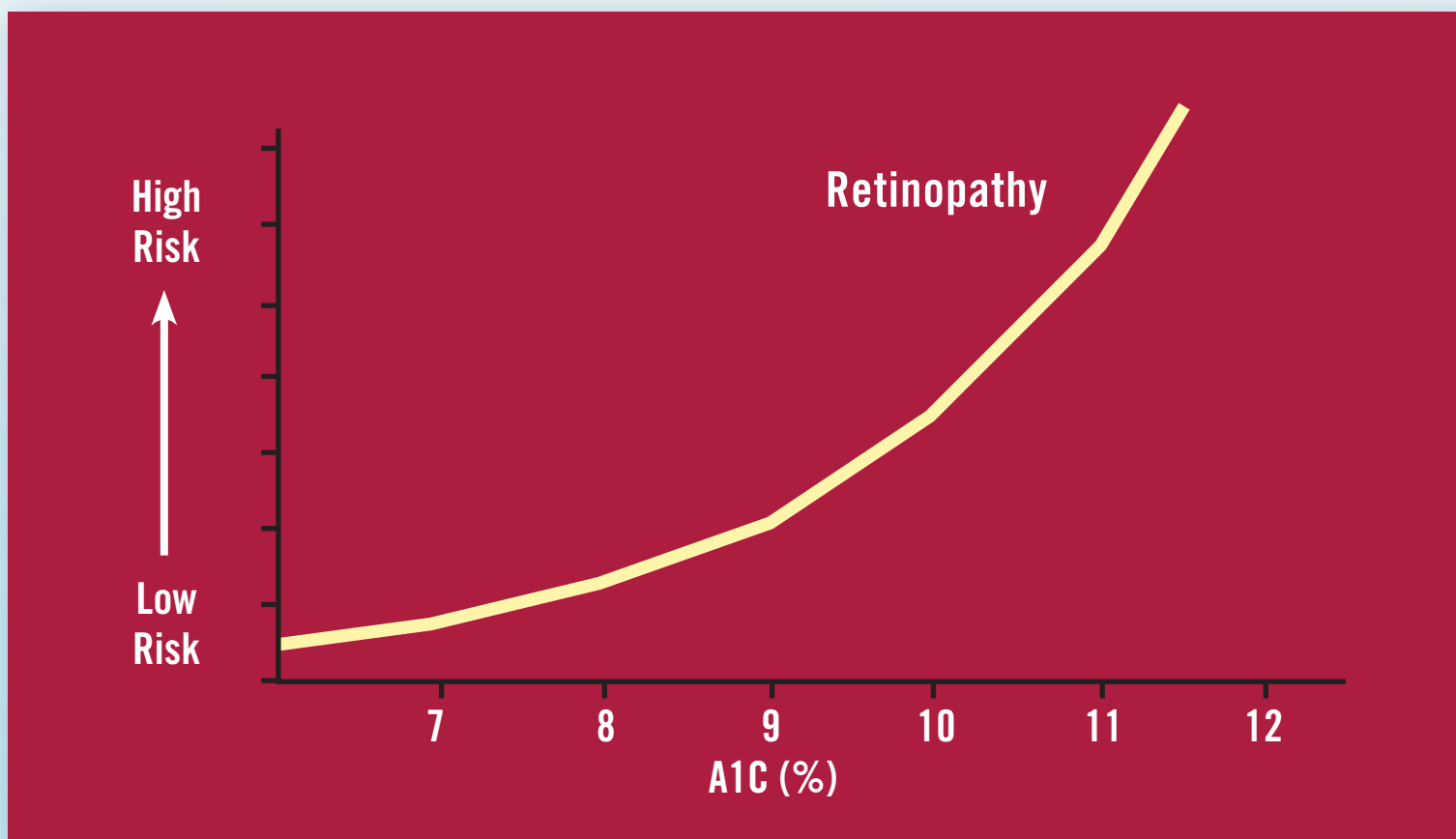
But the good news is that there's a lot that you can do to lower your risk of eye problems and vision loss. Here's how:

- **Have a retina (dilated) eye exam every year (or as often as your eye doctor recommends).**
- **Keep your blood glucose levels and A1C in your target range.**
  - Blood glucose goals: For most people, these are 70 to 130 before meals and less than 180 two hours after meals.
  - A1C goal: For most people, the goal is less than 7%.

- **Keep your blood pressure at or below your target.**
  - Blood pressure goal: For most people, the goal is a blood pressure at or below 140/80.
- **Keep your LDL (bad) cholesterol at target.**
  - LDL goal: For most, less than 100, or less than 70 if you have had a heart attack or have heart disease.
- **Maintain a healthy weight.\***
  - Losing even 5% to 10% of your body weight can help.
- **Be physically active most days of the week.\***
  - Activity goal: At least 30 minutes most days. You can break it up into three 10-minute segments.
- **Stop smoking.**
  - Goal: If you smoke, talk to your provider about things that can help you quit, like programs, pills or patches.

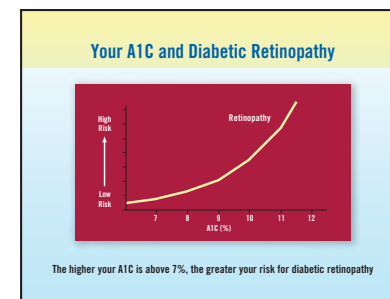
\*Talk to your doctor before starting any diet or exercise program.

# Your A1C and Diabetic Retinopathy



**The higher your A1C is above 7%, the greater your risk for diabetic retinopathy**

# Your A1C and Diabetic Retinopathy

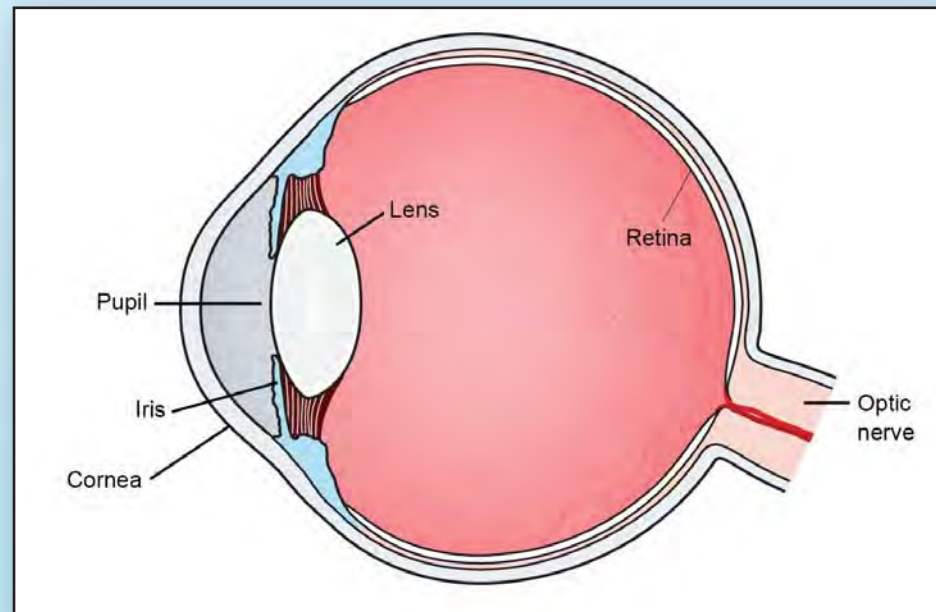


- Your A1C (sometimes called hemoglobin A1C or glycohemoglobin) is a number that tells the average of all your blood glucose levels over the past 2 to 3 months.
- Your healthcare provider can measure your A1C by doing a blood test. It's usually checked 2 to 4 times a year.
- As you can see from this graph, the higher your A1C goes above 7%, the greater your risk of developing diabetic retinopathy.
- The good news, though, is that for every 1% you lower your A1C, you can lower your risk of diabetic retinopathy by approximately 40%. You also lower the risk of other types of diabetes complications such as kidney disease and nerve damage.
- Make sure you know what your A1C is, what your goal should be, and how often you should get it checked.
- If your A1C is above your target, talk with your healthcare provider about steps you can take to lower it.



# How Diabetes Can Affect Your Eyes

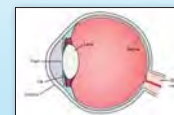
- Having diabetes puts you at risk for diabetic eye disease.
- Diabetic retinopathy and diabetic macular edema are two leading causes of vision loss from diabetic eye disease.
- You can have diabetic eye disease and not know it!
- Diabetes can affect many parts of the eye, including the retina, the lens and the optic nerve.



# How Diabetes Can Affect Your Eyes

## How Diabetes Can Affect Your Eyes

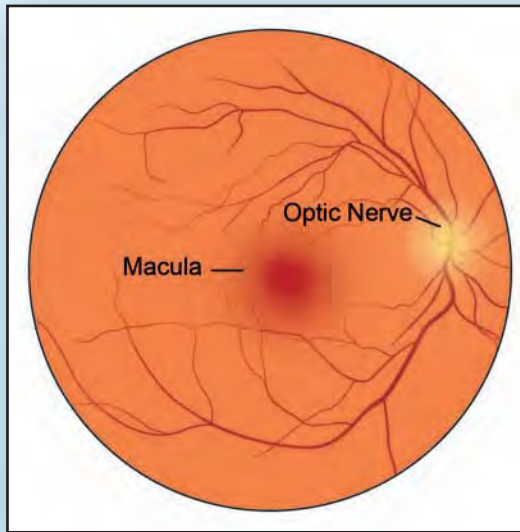
- Having diabetes puts you at risk for diabetic eye disease.
- Diabetic retinopathy and diabetic macular edema are two leading causes of vision loss from diabetic eye disease.
- You can have diabetic eye disease and not know it!
- Diabetes can affect many parts of the eye, including the retina, the lens and the optic nerve.



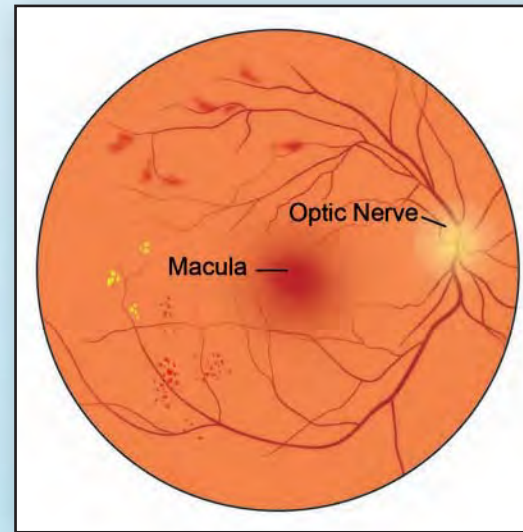
- Everyone with diabetes (type 1 or type 2) is at risk for getting diabetic eye disease. The longer you've had diabetes, the more likely you are to get diabetic retinopathy and diabetic macular edema. Here's why:
  - High blood glucose levels can block and damage the small blood vessels in the retina.
  - This damage can cause diabetic retinopathy and diabetic macular edema.
- The retina, which is in the back of your eye, lets you see light. The center of the retina is called the macula and this gives you sharp, detailed vision.
- Diabetic retinopathy and diabetic macular edema are the two leading causes of vision loss from diabetic eye disease.
- You can have diabetic eye disease and not know it. Often, there are no symptoms, even with severe disease.
- Diabetes can affect many parts of the eye, besides the retina, including the lens (causing cataracts) and the optic nerve (caused by glaucoma).
- Early detection, starting with a dilated (retina) eye exam, and treatment (if needed) can help preserve your vision and protect against vision loss.

# Diabetic Retinopathy

- Diabetic retinopathy is the most common type of diabetic eye disease
- You can have diabetic retinopathy and not have any symptoms



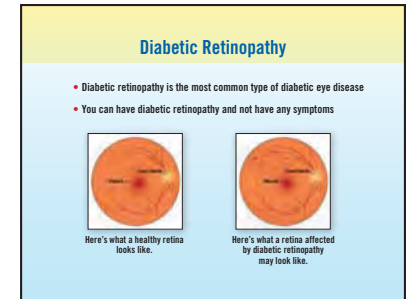
Here's what a healthy retina looks like.



Here's what a retina affected by diabetic retinopathy may look like.



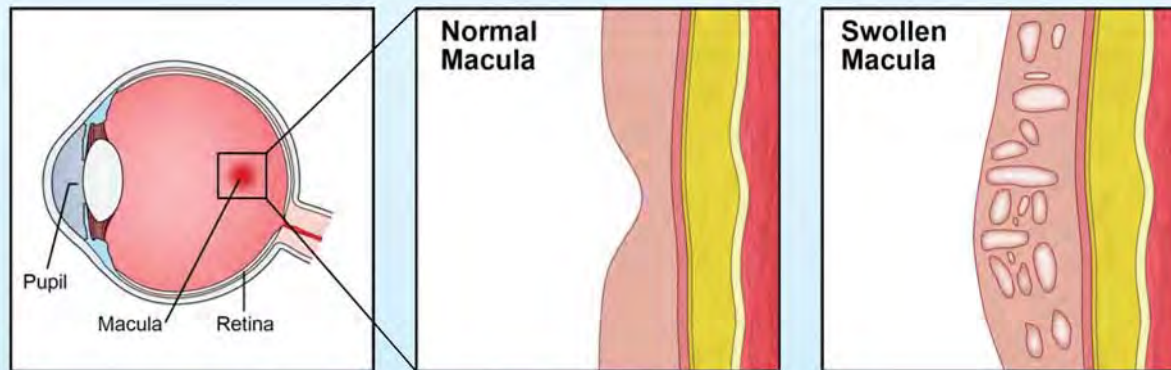
# Diabetic Retinopathy



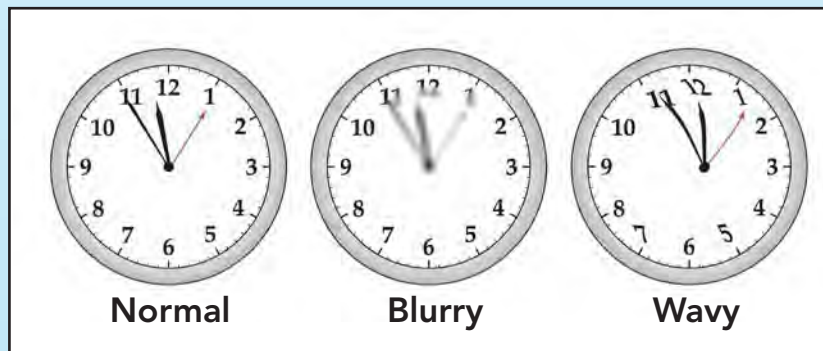
- Diabetic retinopathy refers to changes in the retina due to diabetes.
- The retina may become damaged from high blood glucose levels.
- Diabetic retinopathy is the most common type of eye disease for people with diabetes and is the leading cause of preventable new onset blindness in people with diabetes.
- On the left is a picture of a healthy retina.
- On the right is a retina affected by diabetic retinopathy. Retinopathy can cause new, weaker blood vessels to form. These blood vessels can break and bleed into the retina or into the center of the eye, called the vitreous chamber. (lipid deposits: yellow; bleeding and vessel abnormalities: red)
- One reason that having regular dilated eye exams is so important is that you may not have any symptoms of retinopathy. A dilated eye exam can find any changes or problems early on so that they can be treated before they cause visual loss.
- There are different levels of retinopathy severity. If you have retinopathy, ask your eye doctor what type and what severity of retinopathy you have.
- Diabetic retinopathy is treated very effectively with scatter, or panretinal, laser treatment. The eye doctor will place many little "burns" on the retina, causing abnormal blood vessels to shrink.

# Diabetic Macular Edema

- **Diabetic macular edema occurs when blood vessels in the retina leak blood or fluid into the macula, causing swelling.**



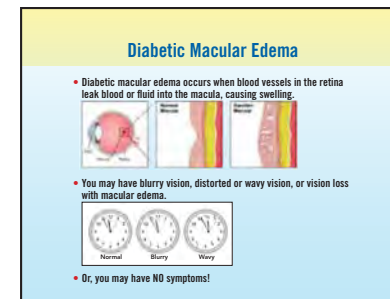
- **You may have blurry vision, distorted or wavy vision, or vision loss with macular edema.**



- **Or, you may have NO symptoms!**

# Diabetic Macular Edema

- Diabetic macular edema is caused by fluid from damaged blood vessels leaking into the macula, the part of the retina that allows for clear, sharp and distinct vision.
- If macular edema occurs, the macula can swell, possibly leading to blurry, washed-out vision, distortion and even vision loss.
- You can have early macular edema and not have any symptoms! That's why regular dilated eye exams are so important.

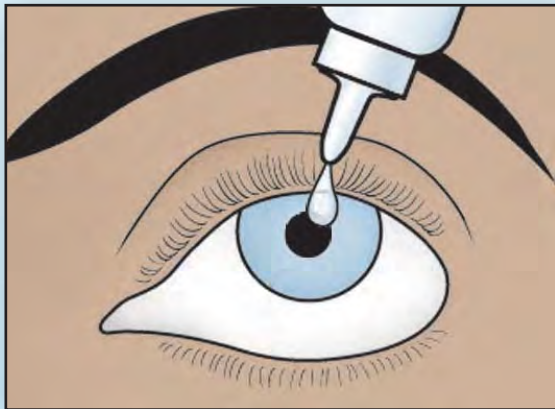


- You can have diabetic retinopathy and diabetic macular edema at the same time or independently.
- If you have diabetic macular edema, you should be treated by an expert eye-care doctor.
- Treatments for DME can help prevent vision loss and in some cases, improve vision. You and your eye doctor can discuss the best treatment for you.

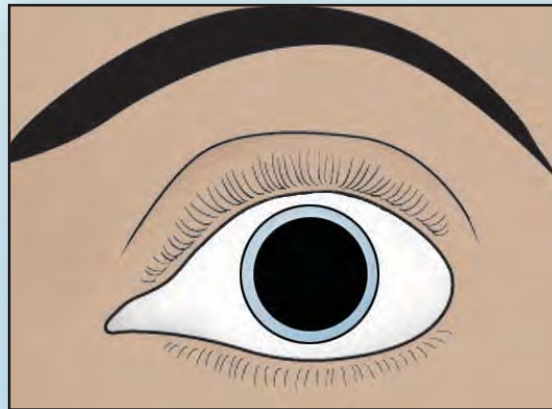


# The Dilated (Retina) Eye Exam

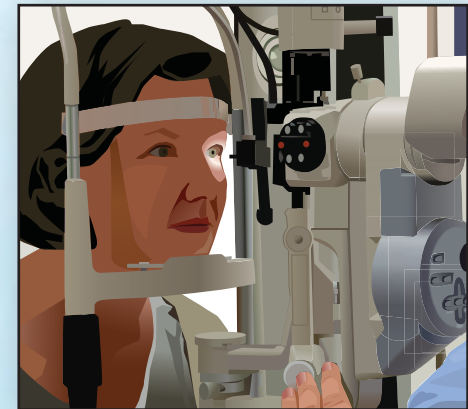
Protect your vision by getting regular, dilated (retina) eye exams.



**1. Dilating drops are put in your eyes.**

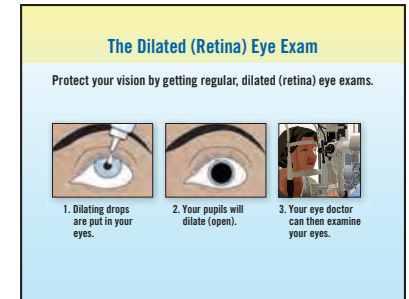


**2. Your pupils will dilate (open).**



**3. Your eye doctor can then examine your eyes.**

# The Dilated (Retina) Eye Exam



- Diabetic retinopathy and diabetic macular edema can be effectively found only with a dilated (retina) eye exam done by your eye doctor. An eye exam in which you get glasses or contact lenses without dilating your pupils does not adequately check for diabetic eye disease.
  - You should have a dilated eye exam at least once a year, or more often if recommended by your eye doctor.
  - During a dilated eye exam, the eye doctor will put drops in your eyes to dilate, or widen, your pupils. The eye doctor will then use special lenses to look at your retinas and other parts of your eyes.
  - You will also be asked to read an eye chart to check your distance vision.
  - Your eye doctor will give you a test that measures the pressure inside your eye to check for glaucoma, another type of eye problem that is more common among people who have diabetes.
  - You may need other types of eye tests, too, including a visual field test (to check your peripheral vision) or special photographs.
  - After your exam, your vision will probably be blurry and your eyes will be sensitive to light for awhile. You may need to wear sunglasses for a while, and you should have someone take you home from your eye doctor's office.
- Remember:** a dilated (retina) eye exam is the best way to find and treat any problems with your eyes early on.

Vision loss from diabetic eye disease can be prevented!

# Your Action Plan

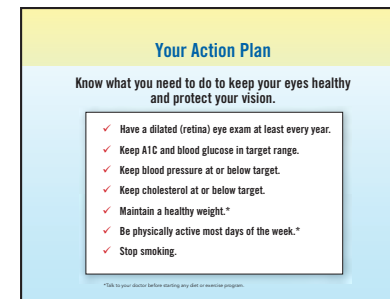
**Know what you need to do to keep your eyes healthy and protect your vision.**

- ✓ **Have a dilated (retina) eye exam at least every year.**
- ✓ **Keep A1C and blood glucose in target range.**
- ✓ **Keep blood pressure at or below target.**
- ✓ **Keep cholesterol at or below target.**
- ✓ **Maintain a healthy weight.\***
- ✓ **Be physically active most days of the week.\***
- ✓ **Stop smoking.**

\*Talk to your doctor before starting any diet or exercise program.



# Your Action Plan



While there's no guarantee that diabetic eye disease can be prevented, it's important to remember that there is a lot that you can do to lower your risk. Here's a reminder of the action steps that you can take to lower your risk.

- **Have a retina (dilated) eye exam every year (or as often as your eye doctor recommends).**
- **Keep your blood glucose levels and A1C in your target range.**
  - Blood glucose goals: for most people with diabetes, these are 70 to 130 before meals and less than 180 two hours after meals.
  - A1C goal: For most, less than 7%.
- **Keep your blood pressure at or below your target.**
  - Blood pressure goal: for most people, the goal is a blood pressure at or below 140/80.

- **Keep your LDL (bad) cholesterol at target.**
  - LDL goal: For most, less than 100 or less than 70 if you have heart disease/heart attack.
- **Maintain a healthy weight.\***
  - Weight goal: Losing even 5% to 10% of your body weight can help.
- **Be physically active most days of the week.\***
  - Activity goal: At least 30 minutes most days. You can break it up into three 10-minute segments.
- **Stop smoking.**
  - Goal: If you smoke, talk to your provider about things that can help you quit, like programs, pills or patches.

**Talk with your healthcare provider about your own goals!**

\*Talk to your doctor before starting any diet or exercise program.

# When to Call Your Eye Doctor

**Call your eye doctor right away if you have any of the following symptoms:**



- Sudden loss of vision
- Severe eye pain
- Feel like a curtain is coming down over your eyes
- See flashing lights or floating spots

**Call your eye doctor if it's been more than 1 year since your last dilated eye exam**

# When to Call Your Eye Doctor

You may not have any symptoms of diabetic eye disease. But it's important to call your eye doctor right away if any of these symptoms occur:


- Sudden loss of vision
- Severe eye pain
- Feel like a curtain is coming down over your eyes
- See flashing lights or floating spots

You should also call your eye doctor if you have any of these symptoms:

- Blurry vision
- A change in your vision's focus for both near (reading) and distance (driving, movies, television) vision
- Straight lines that appear wavy

**When to Call Your Eye Doctor**

Call your eye doctor right away if you have any of the following symptoms:



- Sudden loss of vision
- Severe eye pain
- Feel like a curtain is coming down over your eyes
- See flashing lights or floating spots

Call your eye doctor if it's been more than 1 year since your last dilated eye exam



# Understanding **DIABETIC RETINOPATHY**

## **How does diabetic retinopathy cause vision loss?**

Blood vessels damaged from diabetic retinopathy can cause vision loss in 2 ways:

1. Diabetic retinopathy leads to the formation of abnormal blood vessels that are fragile and tend to leak blood into the center of the eye, blurring vision. This is known as proliferative retinopathy and is the most advanced stage of the disease.
2. Diabetic retinopathy can also lead to fluid leaking into the center of the macula, which is the part of the eye responsible for sharp vision, causing swelling that blurs vision. This condition is called macular edema and can occur at any stage of diabetic retinopathy, although it is more likely to occur as the disease progresses. About half of the people with proliferative retinopathy also have macular edema.

## **Who is at risk for diabetic retinopathy?**

Patients with either type 1 or type 2 diabetes can develop diabetic retinopathy and should have a comprehensive dilated eye exam at least once a year. Approximately 40%-45% of patients with diabetes will develop diabetic retinopathy, with the likelihood increasing with the duration of the disease.

The risk of diabetic retinopathy is increased for pregnant women who have diabetes, underscoring the need for a comprehensive dilated eye exam as soon as possible after the pregnancy is confirmed, and clinicians may recommend additional exams during pregnancy.

## **What can I do to protect my vision?**

If you have diabetes, having a comprehensive dilated eye exam at least once a year is critical.

- Proliferative retinopathy can develop without symptoms and puts the patients at high risk for vision loss.
- Macular edema can develop without symptoms.
- Both proliferative retinopathy and macular edema can occur in patients who do not have vision loss, so this should not be taken as a sign that disease is not progressing or that eye exams are not necessary.

After diabetic retinopathy is diagnosed, more frequent eye exams may be necessary. Timely treatment and appropriate follow-up care can significantly reduce the risk of blindness.

Improved control of blood sugar levels has been shown to slow the onset and progression of retinopathy. Controlling blood sugar levels also reduces the risk of kidney and nerve disease. Consult with your endocrinologist to determine the best strategy for controlling blood sugar.

## **How are macular edema and diabetic retinopathy treated?**

Macular edema can be treated with injections of steroids or anti-VEGF agents with or without focal laser treatment where the clinician places up to several hundred small laser burns in the areas of retinal leakage surrounding the macula. These burns slow the leakage of fluid and reduce the amount of fluid in the retina. Repeat treatments may be necessary if the leakage is not completely addressed or returns. Your clinician will discuss the best course of treatment for you.

During the early stages of diabetic retinopathy, unless macular edema is present, no ocular treatment is needed. To prevent progression of diabetic retinopathy, people with diabetes should control their levels of blood sugar, blood pressure, and blood cholesterol.

Proliferative retinopathy is treated with scatter laser treatment, which helps to shrink the abnormal blood vessels. Because a high number of laser burns are necessary, 2 or more sessions usually are required to complete treatment. Scatter laser treatment is more effective earlier in the course of the disease, underscoring the need for regular, comprehensive dilated eye exams.

## RESOURCES FOR INDIVIDUALS WHO ARE BLIND OR VISUALLY IMPAIRED

### State of Wisconsin, Office for the Blind and Visually Impaired

1 W Wilson St.

[www.dhs.wisconsin.gov/blind](http://www.dhs.wisconsin.gov/blind)

PO Box 7851

Madison, WI 53707-7851

888-879-0017

State-wide organization of Rehabilitation Specialists and Associates who teach independent living skills to individuals in their homes and to groups; demonstrate adaptive equipment; and provide information and referral services.



### Wisconsin Council of the Blind and Visually Impaired

754 Williamson St.

[www.wcblind.org](http://www.wcblind.org)

Madison, WI 53703

800-783-5213

608-255-1166

Adaptive equipment, information and referral, low vision evaluations, rehabilitation teaching, computer training, scholarships, and white canes.



### Vision Forward Association

912 N Hawley Rd.

[www.vision-forward.org](http://www.vision-forward.org)

Milwaukee, WI 53213

855-878-6056

414-615-0100

Adaptive equipment, housing, low vision evaluations, rehabilitation services for children and adults, computer training, support groups, volunteers, social and recreational programs.



### Hadley Institute for the Blind and Visually Impaired

700 Elm St.

[www.hadley.edu](http://www.hadley.edu)

Winnetka, IL 60093-2554

800-323-4238

847-446-8111

Offers distance learning courses relevant to the needs of individuals experiencing a vision loss, their families, and professionals working in the blindness rehabilitation field.



### Statutory Council on Blindness

1 W Wilson St. [www.blindnesscouncil.wisconsin.gov](http://www.blindnesscouncil.wisconsin.gov)

PO Box 7851

Madison, WI 53707-7851

888-879-0017

A statutory body appointed by the Secretary of the State Department of Health Services (DHS). The Council advises and makes recommendations to DHS and other state agencies on issues regarding blindness.





## Wisconsin Talking Book and Braille Library

813 W Wells St. <http://talkingbooks.dpi.wi.gov>  
Milwaukee, WI 53233-1436

A lending library specializing in Talking Books and recorded magazines, provided at no cost to the consumer.



800-242-8822  
414-286-3045

## Wisconsin Center for the Blind and Visually Impaired

1700 W State St [www.wcbvi.k12.wi.us](http://www.wcbvi.k12.wi.us)  
Janesville, WI 53546

Offers an academic educational facility for children who are visually impaired and a summer rehabilitation program for adults with vision loss.



800-832-9784  
608-758-6100

## Division of Vocational Rehabilitation

201 E Washington Ave <http://dwd.wisconsin.gov/dvr>  
PO Box 7852  
Madison, WI 53707-7852

Wisconsin's Vocational Rehabilitation (VR) is a federal/state program of VR counselors who work with consumers, employers, and other partners to obtain, maintain, and improve employment for people with disabilities.



800-442-3477

## Other Organizations

- American Foundation for the Blind



[www.afb.org](http://www.afb.org) or [www.afb.org/seniorsitehome.asp](http://www.afb.org/seniorsitehome.asp)

800-232-5463



- National Federation of the Blind

[www.nfb.org](http://www.nfb.org) 

410-659-9314


- Lighthouse International



[www.lighthouse.org](http://www.lighthouse.org)

800-829-0500

- VisionAware

[www.visionaware.org](http://www.visionaware.org) 

914-528-5120

- WI Lions Camp



[www.wisconsinlionscamp.com](http://www.wisconsinlionscamp.com)

715-677-4969

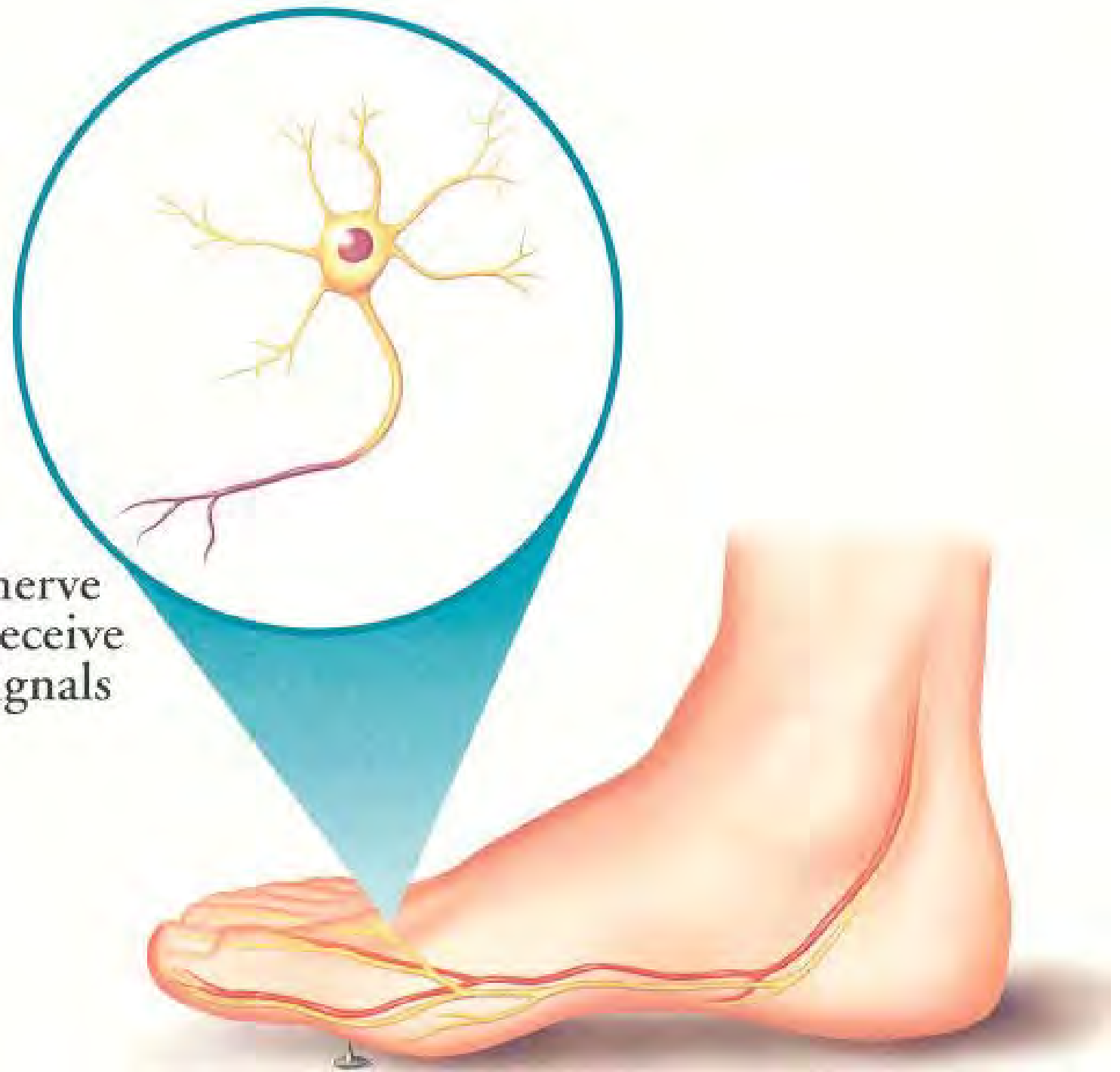
- National Eye Institute

[www.nei.nih.gov](http://www.nei.nih.gov) 

301-496-5248



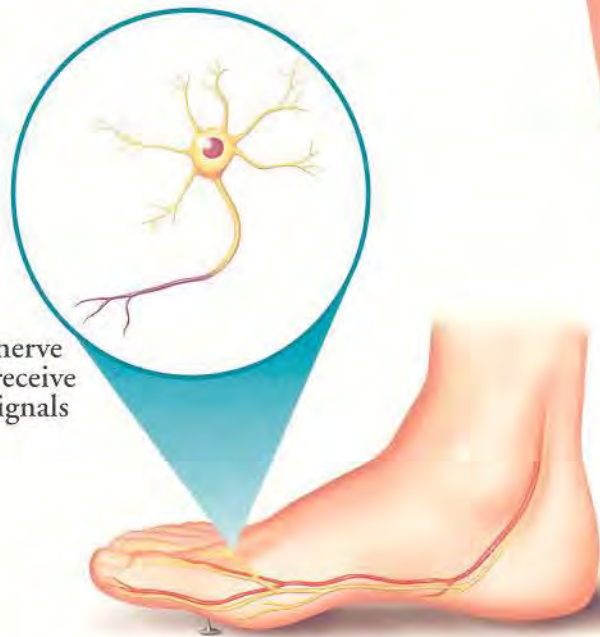
Damaged nerve  
unable to receive  
and send signals



**Nerve damage causes a loss of sensation**

# The Progression of **Diabetic Foot Disease**

High glucose levels can affect the nerves' ability to send signals. As a result, your feet may lose sensation. A cut or sore can become infected before you know it.



Damaged nerve  
unable to receive  
and send signals

**Nerve damage causes a loss of sensation**



**Redness**

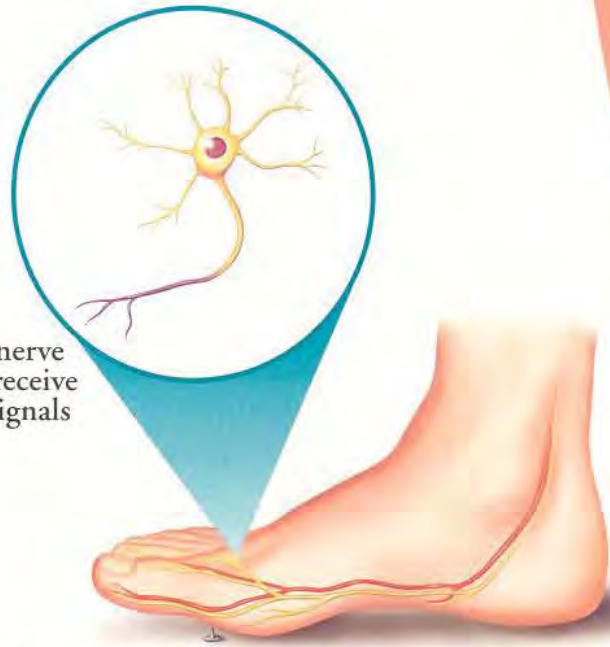
Checking your feet  
daily will help you  
detect even the  
slightest change in  
your foot.

**TRAUMA**

Turn inside dial to appropriate  
window for viewing stages of  
diabetic foot disease.

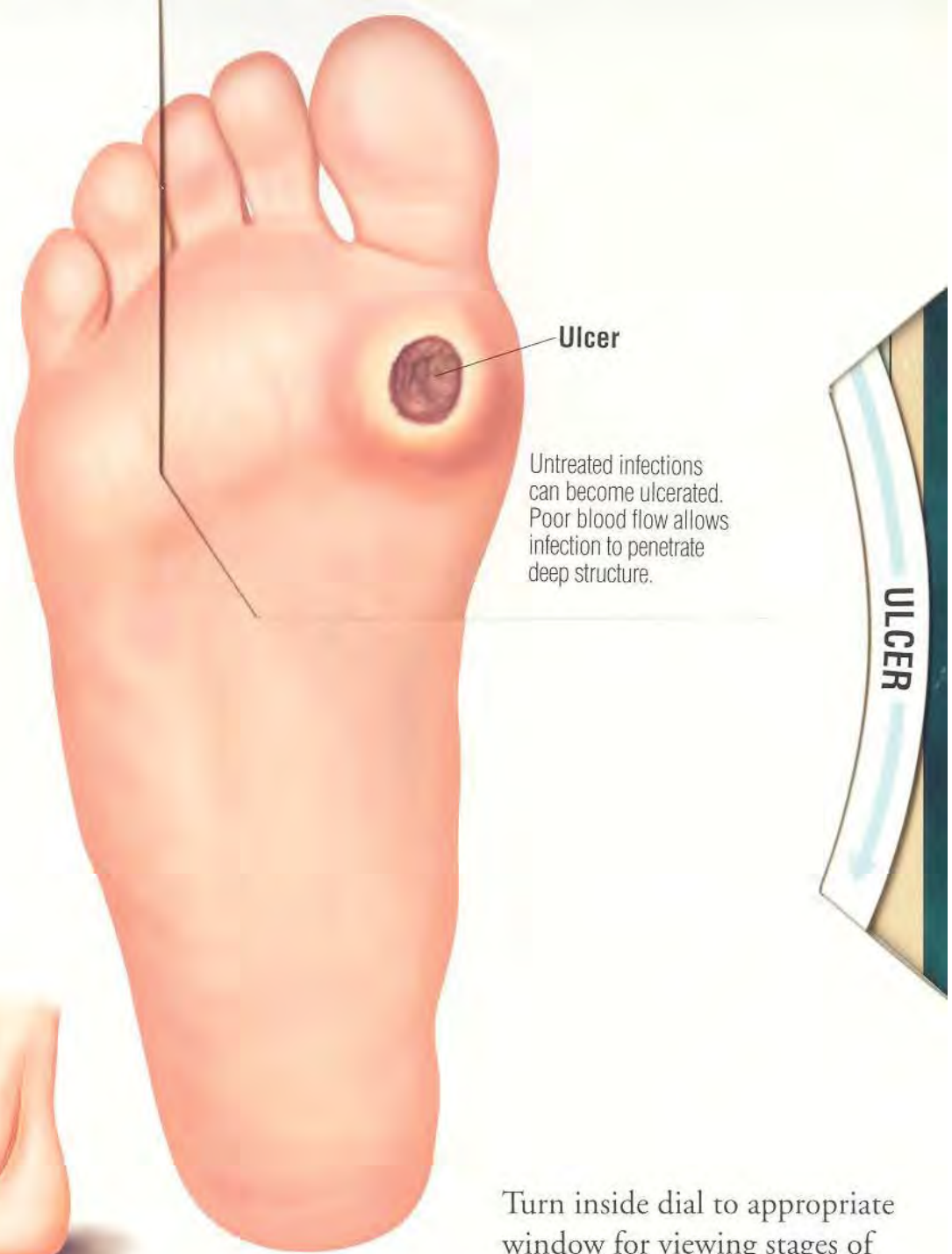
# Diabetic Foot Disease

High glucose levels can affect the nerves' ability to send signals. As a result, your feet may lose sensation. A cut or sore can become infected before you know it.



Damaged nerve unable to receive and send signals

**Nerve damage causes a loss of sensation**



Ulcer

Untreated infections can become ulcerated. Poor blood flow allows infection to penetrate deep structure.

ULCER

Turn inside dial to appropriate window for viewing stages of diabetic foot disease.



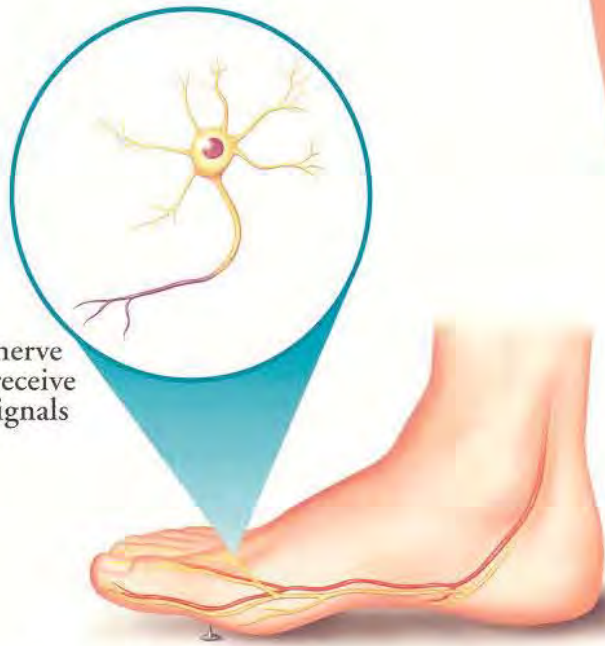
# Diabetic Foot Disease

High glucose levels can affect the nerves' ability to send signals. As a result, your feet may lose sensation. A cut or sore can become infected before you know it.



Infection  
Fluid buildup

Pressure on the foot can cause blisters. Poor blood flow in the foot results in infection. High glucose levels feed infection.



Damaged nerve unable to receive and send signals

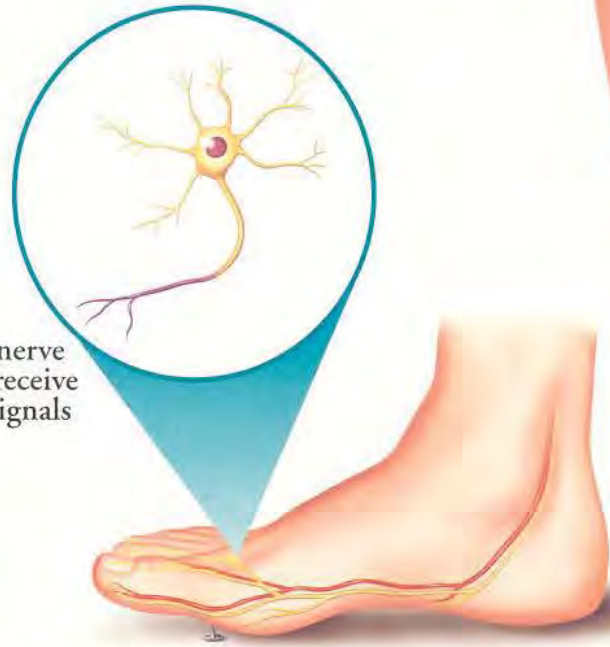
Nerve damage causes a loss of sensation

Turn inside dial to appropriate window for viewing stages of diabetic foot disease.



# Diabetic Foot Disease

High glucose levels can affect the nerves' ability to send signals. As a result, your feet may lose sensation. A cut or sore can become infected before you know it.



Damaged nerve unable to receive and send signals

**Nerve damage causes a loss of sensation**



Poor blood flow and infection in the foot progress to gangrene. Amputation may be necessary.

Turn inside dial to appropriate window for viewing stages of diabetic foot disease.

# DIABETIC FOOT SCREEN FOR LOSS OF PROTECTIVE SENSATION

National Hansen's Disease Programs, LEAP Program, 1770 Physicians Park Dr., Baton Rouge, LA 70816

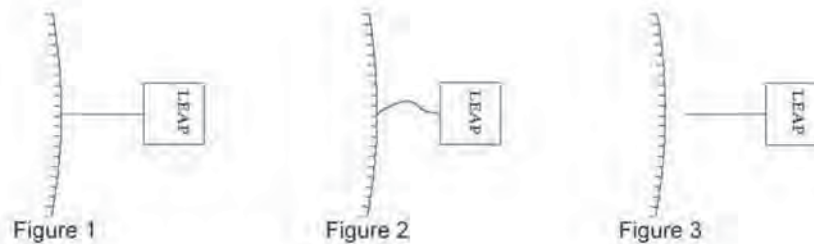
## Filament Application Instructions:

- 1) Show the filament to the patient and touch it to his/her hand or arm so that he/she knows it does not hurt.
- 2) Use the 10 gram filament to test sensation at the indicated sites on each foot as shown. Apply the filament along the perimeter of and NOT on an ulcer, callous, scar, or necrotic tissue.



**Note: While five sites on each foot are necessary for proper sensation testing, additional sites are preferred, as shown here.**

- 3) Hold the filament perpendicular to the skin and use a smooth motion when testing. Use a 3 step sequence that includes (1) touch the skin, (2) bend the filament, and (3) lift from the skin (*See Figures 1-3*). Do not use rapid movement. The approach, skin contact, and departure of the filament should be approximately 1½ seconds duration.



- 4) Ask the patient to respond "yes" when the filament is felt. If the patient does not respond when you touch a given point on the foot, continue on to another site. When you have completed the sequence, REPEAT the area(s) where the patient did not indicate feeling the filament.
- 5) Use the filament in a random sequence.
- 6) On the form, indicate with a minus sign, "—", the areas where the patient did not respond to the filament. LOSS OF PROTECTIVE SENSATION AT ANY ONE OF THE EIGHT SITES INDICATES A FOOT AT HIGH RISK.
- 7) If you wish to clean the filament, use sodium hypochlorite (*household bleach*) 1:10 solution or follow the infection control disinfecting guidelines in your facility.

JF/06/2005

# Foot Health Facts

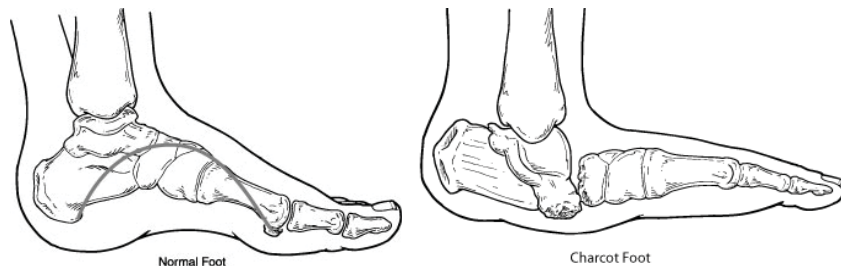
HEALTHY FEET FOR AN ACTIVE LIFE

## Charcot Foot

### What Is Charcot Foot?

Charcot foot is a condition causing weakening of the bones in the foot that can occur in people who have significant nerve damage (neuropathy). The bones are weakened enough to fracture, and with continued walking the foot eventually changes shape. As the disorder progresses, the joints collapse and the foot takes on an abnormal shape, such as a rocker-bottom appearance.

Charcot foot is a very serious condition that can lead to severe deformity, disability, and even amputation. Because of its seriousness, it is important that patients with diabetes—a disease often associated with neuropathy—take preventive measures and seek immediate care if signs or symptoms appear.



### Causes

Charcot foot develops as a result of neuropathy, which decreases sensation and the ability to feel temperature, pain, or trauma. Because of diminished sensation, the patient may continue to walk—making the injury worse.



People with neuropathy (especially those who have had it for a long time) are at risk for developing Charcot foot. In addition, neuropathic patients with a tight Achilles tendon have been shown to have a tendency to develop Charcot foot.

## **Symptoms**

The symptoms of Charcot foot may include:

- Warmth to the touch (the affected foot feels warmer than the other)
- Redness in the foot
- Swelling in the area
- Pain or soreness

## **Diagnosis**

Early diagnosis of Charcot foot is extremely important for successful treatment. To arrive at a diagnosis, the surgeon will examine the foot and ankle and ask about events that may have occurred prior to the symptoms. X-rays and other imaging studies and tests may be ordered.

Once treatment begins, x-rays are taken periodically to aid in evaluating the status of the condition.

## **Non-Surgical Treatment**

It is extremely important to follow the surgeon's treatment plan for Charcot foot. Failure to do so can lead to the loss of a toe, foot, leg, or life.

Non-surgical treatment for Charcot foot consists of:

- ***Immobilization.*** Because the foot and ankle are so fragile during the early stage of Charcot, they must be protected so the weakened bones can repair themselves. Complete non-weightbearing is necessary to keep the foot from further collapsing. The patient will not be able to walk on the affected foot until the surgeon determines it is safe to do so. During this period, the patient may be fitted with a cast, removable boot, or brace, and may be required to use crutches or a wheelchair. It may take the bones several months to heal, although it can take considerably longer in some patients.
- ***Custom shoes and bracing.*** Shoes with special inserts may be needed after the bones have healed to enable the patient to return to daily activities—as well as help prevent recurrence of Charcot foot, development of ulcers, and possibly amputation. In cases with significant deformity, bracing is also required.
- ***Activity modification.*** A modification in activity level may be needed to avoid repetitive trauma to both feet. A patient with Charcot in one foot is more likely to develop it in the other foot, so measures must be taken to *protect both feet*.

### **When is Surgery Needed?**

In some cases, the Charcot deformity may become severe enough that surgery is necessary. The foot and ankle surgeon will determine the proper timing as well as the appropriate procedure for the individual case.

## Preventive Care

The patient can play a vital role in preventing Charcot foot and its complications by following these measures:

- Keeping blood sugar levels under control can help reduce the progression of nerve damage in the feet.
- Get regular check-ups from a foot and ankle surgeon.
- Check *both* feet every day—and see a surgeon immediately if you notice signs of Charcot foot.
- Be careful to avoid injury, such as bumping the foot or overdoing an exercise program.
- Follow the surgeon's instructions for long-term treatment to prevent recurrences, ulcers, and amputation.





## What is Peripheral Artery Disease?

Peripheral Artery Disease (PAD) is also known as atherosclerosis, poor circulation, or hardening of the arteries. PAD progresses over time at variable rates in each individual depending on the area of circulation affected and one's health and family history. The signs and symptoms of PAD may not arise until later in life. For many, the outward indications will not appear until the artery has narrowed by 60 percent or more.

One method the body uses to adapt to the narrowed arteries is the development of smaller peripheral arteries that allow blood flow around the narrowed area. This process is known as collateral circulation and may help explain why many can have PAD without feeling any symptoms.

When a piece of cholesterol, calcium or blood clot abruptly breaks from the lining of the artery or a narrowed artery blocks off completely, blood flow will be totally obstructed and the organ supplied by that artery will suffer damage. The organs in PAD most commonly affected and researched are the legs.

## What happens if the disease worsens?

The severity of PAD depends on when it is detected and any pre-existing health factors; especially smoking, high cholesterol, heart disease or diabetes. In the later stages, leg circulation may be so poor that pain occurs in the toes and feet during periods of inactivity or rest. This is especially true at night. This is known as rest pain, which usually worsens when the legs are elevated and is often relieved by lowering the legs (due to the effects of gravity on the blood flow).

## Critical Limb Ischemia

The most advanced stages of PAD can lead to Critical Limb Ischemia (CLI). Here the legs and feet have such severe blockage that they do not receive the oxygen rich blood required for growth and repair of painful sores and even gangrene (dead tissue). This condition, if left untreated, may require amputation.

## Risk Factors

An individual is at risk for developing PAD when one or more of these risk factors are present:

**Smoking** - This is the number one risk factor for PAD. Those that smoke not only put themselves at risk for developing arterial disease but also undermine attempts at treatment.

**Diabetes** - Individuals with diabetes are at a greater risk for developing PAD due to its effect on blood vessels.

**History of Heart Disease** - A family history of cardiovascular disease is an indicator for developing PAD.

**Hypertension** (*high blood pressure*) - When blood pressure remains high, the lining of the artery walls becomes damaged. Many PAD patients also have high blood pressure.

**Age** - In the United States, those 50 years or older are at greater risk to develop PAD. PAD affects both men and women, but occurs slightly more in men. The percentage of elderly people that are affected is:

Age	% Affected
40-59	3%
60-69	8%
70 or older	19%

**High levels of Homocysteine** - This is an amino acid found in plasma (blood). Some recent studies show higher levels are associated with PAD.

## Symptoms

Most people do not have symptoms, but for many, the first noticeable symptom of PAD is a painful cramping of leg muscles during walking called intermittent claudication. When a person rests, the cramping goes away. This leg pain can be severe enough to deter a person from normal walking.

Some individuals will not feel cramping or pain but might feel a numbness, weakness or heaviness in the muscles. In patients whose PAD is more severe, insufficient blood flow to the feet and legs may cause a burning/aching pain in the feet and toes while resting. The pain will occur particularly at night while lying flat. Other symptoms include:

- Cooling of skin in specific areas of legs or feet
- Color changes in the skin and loss of hair
- Toe and foot sores that do not heal

## “Silent PAD”

Many people are affected by PAD yet they do not have symptoms. These individuals are at a high risk for suffering an early heart attack or stroke. Research has proven that the life expectancy for a person with PAD is greatly reduced. For example, the risk of dying from heart disease is six times higher for those with PAD compared to those without. Therefore, it is important to discuss the possibility of PAD with a health care professional if someone has several of the risk factors for PAD.

## THE VASCULAR DISEASE FOUNDATION

Established in 1998, the Vascular Disease Foundation (VDF) develops educational information and initiatives for patients, their families and friends, and health care providers regarding often ignored, but serious vascular diseases. In fact, VDF is the only multidisciplinary national public 501(c)(3) non-profit organization focused on providing public education and improving awareness about vascular diseases. For more information, visit [vasculardisease.org](http://vasculardisease.org).



## Diagnosis

Several tests may be required to diagnose PAD and determine the extent of the disease. Some of these tests may be performed in a primary care physician's office, whereas others may be performed by a vascular specialist or in a vascular lab. Most tests are non-invasive and thus should be fairly painless.

- Medical history and physical exam
- Ankle-Brachial Index (ABI)
- Treadmill Exercise Test
- Reactive Hyperemia Test
- Segmental Pressure Measurements
- PVR Waveform Analysis
- Duplex Arterial Imaging or Ultrasound Imaging
- Photoplethysmography (PPG)
- Arteriogram

## Treatment

Treatment options vary and depend on the overall health of the patient and the severity of the diagnosis. The health care provider should provide the patient with adequate information to help understand all options. The majority of intermittent claudication cases are treated without surgery. A treatment plan usually involves lifestyle changes and one or more of the following:

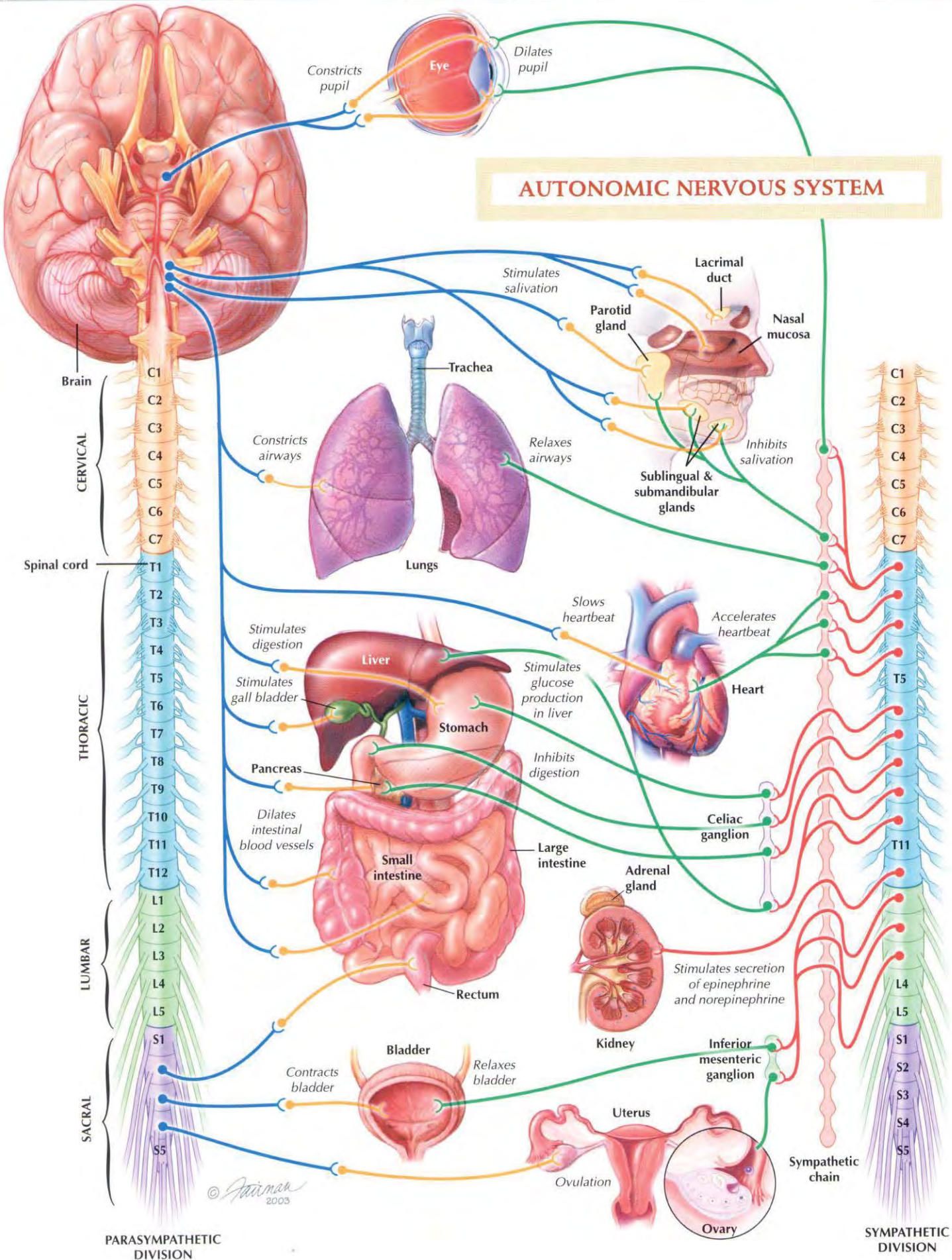
- Exercise therapy
- Lifestyle modifications
- Medication
- Diet
- Smoking cessation
- Diabetes management
- Blood pressure management
- Foot care
- Endovascular therapy
- Vascular surgery

*Help the Vascular Disease Foundation continue to make this critical educational information available. Your contribution will make saving lives a greater reality. Make a donation today at: [contact.vasculardisease.org/donate](http://contact.vasculardisease.org/donate)*

To find out more about the Vascular Disease Foundation, call 888.833.4463 or visit us online at [www.vasculardisease.org](http://www.vasculardisease.org)



# AUTONOMIC NERVOUS SYSTEM





# The Forgotten Nerves

By Robert S. Dinsmoor

Illustrated by Jennifer Fairman

It's common knowledge that people with type 1 diabetes are at increased risk for developing a number of serious health complications. Diabetes-related kidney disease, eye disease, nerve disease, and cardiovascular problems are well known, well studied, and fairly easy for diabetes specialists to detect and diagnose. And thankfully, decades of research progress have unearthed a number of promising treatment approaches and innovative therapies that can help prevent and/or delay the most serious consequences of these complications.

All the while, however, a less well-known condition has continued to complicate the lives of some people with diabetes, causing symptoms and health problems that range from mild and inconvenient to devastating. Remarkably, autonomic neuropathy continues to perplex the research and healthcare communities. Unlike peripheral neuropathy (the familiar form of diabetes-related nerve disease), which results in a fairly distinct set of symptoms that can be easily recognized and associated with diabetes, autonomic neuropathy can cause all kinds of symptoms that, at first glance, appear to be related to something other than diabetes.

Since most people have never even heard of autonomic neuropathy, it is no surprise they rarely connect its symptoms with diabetes. Even physicians and healthcare professionals might not immediately recognize such problems as chronic heartburn, frequent diarrhea, incontinence, or profuse sweating as related to diabetes. In its most dangerous form, autonomic neuropathy can damage the cardiovascular system, causing fluctuations in blood pressure and heartbeat—or worse, a sudden heart attack.

For a multitude of reasons, autonomic neuropathy has been a relatively small bleep on the diabetes research and treatment radar screen. Until recently, it was extremely difficult to diagnose and virtually impossible to treat. The majority of symptoms and health problems caused by autonomic neuropathy mimic other more treatable disorders and conditions, many of which are common in the general population. Thus, the healthcare community has relied on familiar therapies and pharmaceutical agents to individually address each specific symptom and problem.

Now, with increasing evidence that autonomic neuropathy can be slowed and perhaps even reversed in its early stages, researchers have taken a renewed interest in discovering its causes and developing new potential therapies.

## HEART EFFECTS

Autonomic nerves control heart rate and blood pressure.

**SYMPTOM:** Normally, a person's heart rate changes in response to shifts in activity level: When the person is active or stressed, the heart rate speeds up, and when he or she rests, it slows down. In people with autonomic neuropathy, the heart may beat rapidly all the time (a condition called tachycardia) and may not change much in response to activity level or stress.

**TREATMENT:** Research has shown that eliminating cardiovascular risk factors (i.e., smoking cessation, blood pressure control, blood glucose control, exercise, diet low in saturated fats, weight loss) can help reduce autonomic neuropathy.

**SYMPTOM:** In healthy people, blood pressure returns to normal very quickly in response to changes in position, because the autonomic nervous system widens and constricts blood vessels throughout the body. For example, when we stand up, the blood vessels in the legs constrict in order to maintain stable blood pressure. In someone with autonomic neuropathy, this fails to happen. When he or she stands up, blood pressure plummets and does not return to normal as quickly. This condition, known as orthostatic hypotension, may lead to dizziness, lightheadedness, and even unconsciousness.

**TREATMENT:** A number of treatments are available for orthostatic hypotension. Some nonmedical measures include elevating the head of the bed and putting on waist-high elastic stockings before getting out of bed. A number of available medications are also effective in increasing blood volume and improving blood vessel function.

**SYMPTOM:** Autonomic neuropathy may mask the pain of angina or a heart attack (a so-called "silent" heart attack). This can make people less likely to seek timely treatment of a heart attack, raising their risk of severe heart failure and even death.

**TREATMENT:** Regular cardiovascular screenings can help detect early signs of cardiac autonomic neuropathy before symptoms become unmanageable. An electrocardiogram may be used to determine whether a heart attack has occurred or is occurring. A number of lifestyle measures (i.e., exercise, smoking cessation, proper diet) and medications (blood pressure and lipid-lowering drugs) can reduce the risk of heart attack.



## WHEN AUTOMATIC PILOT FAILS

Most people with diabetes are aware of peripheral neuropathy, which can cause pain, tingling, burning, or numbness in the hands and feet, but relatively few people know about diabetes-related autonomic neuropathy. Autonomic neuropathy is a disease affecting the autonomic nervous system, which controls automatic functions throughout the body, such as heartbeat and digestion.

## GASTROINTESTINAL EFFECTS

The autonomic nervous system controls the movement of food through the gastrointestinal (GI) tract. The sleeve of muscles surrounding the GI tract must contract in a coordinated fashion to properly move food through the digestive process, and these muscles are controlled by an elaborate system of nerves. Autonomic neuropathy can affect virtually every stage of digestion.

**SYMPTOM:** A sphincter at the bottom of the esophagus ordinarily opens to allow food to enter the stomach and closes to prevent it from backing up into the esophagus. If the sphincter fails to close properly due to autonomic neuropathy, the highly acidic contents of the stomach can back up into the esophagus. This condition, known as gastroesophageal reflux, can cause difficulty swallowing, heartburn, and a feeling of fullness just after beginning to eat.

**TREATMENT:** Gastroesophageal reflux can generally be treated by making lifestyle changes, such as avoiding certain foods and not lying down within two hours of eating. A number of highly effective medications are also available. When necessary, surgical procedures may successfully correct the condition.

**SYMPTOM:** The contraction of stomach muscles normally breaks up food and pushes it into the small intestine. Autonomic neuropathy can produce a condition called diabetic gastroparesis, or delayed stomach emptying, which can lead to a premature feeling of fullness, nausea, and vomiting. Delivery of food to the small intestine and the subsequent absorption of glucose into the bloodstream may be delayed, so blood glucose may not rise in time to match the pre-meal insulin injection, causing unexpected hypoglycemia followed by unexpected hyperglycemia.

**TREATMENT:** Gastroparesis is treated by lifestyle factors such as eating smaller meals or by drugs that stimulate the muscles that control stomach contracting and emptying.

**SYMPTOM:** Autonomic neuropathy can affect the muscles that move food through the bowel, leading to diarrhea or constipation.

**TREATMENT:** Diabetic diarrhea is treated with antibiotics—to control the overgrowth of bacteria in the intestines—as well as changes in diet or the use of certain drugs. Constipation may be improved with lifestyle changes (i.e., drinking plenty of water, exercising regularly, and including fiber in the diet) or by drugs that increase the motility of the bowel.

“The autonomic nervous system works in the background, controlling such important functions as blood pressure, heart rate, bowel and bladder function, and sweating,” explains Phillip A. Low, M.D., professor of neurology, chair of the Division of Neurophysiology, and director of the Autonomic Laboratory at the Mayo Clinic in Rochester, Minnesota. “When things run well, most people are not aware of autonomic nerve function, but when things go wrong, it is manifest in a number of different and sometimes devastating ways.”

Less than 5 percent of people with diabetes have clinical signs of autonomic neuropathy—no noticeable or measurable indication that anything is wrong. But studies suggest that a much larger percentage of individuals with diabetes have abnormalities on autonomic function tests, indicating the nervous system has been damaged and suggesting a potential for clinical symptoms to emerge down the road.

## WHAT CAN BE DONE?

Because of the potential dangers of cardiac autonomic neuropathy, many diabetes experts are urging that anyone with diabetes be screened for cardiac autonomic neuropathy beginning at puberty. The most widely available screening method is heart rate variability (HRV) testing, which picks up changes in heart rate as the patient breathes deeply, performs the Valsalva maneuver (forcing air out of the lungs while closing off the airway), or begins exercising.

In a person with a healthy autonomic nervous system, the heart rate changes markedly in response to all three of these stimuli; a diminished change can indicate that autonomic neuropathy is present.

According to Dr. Low, a number of centers are now using tests to screen for other signs of autonomic neuropathy. One available test measures nerve function in the sweat glands. Another screening method involves monitoring changes in blood pressure as patients perform the Valsalva maneuver and tilt their bodies. If the autonomic nervous system is working well, the blood pressure quickly returns to normal after the activity. In people with autonomic neuropathy, it doesn't.

“Until recently, if you made the diagnosis of autonomic neuropathy, all you could do was commiserate with the patient—so

## ARE ALL NEUROPATHIES CREATED EQUAL?

**OVER THE PAST SEVERAL DECADES**, researchers have learned quite a bit about somatic neuropathies, but research into autonomic neuropathy has lagged behind. Why?

The problem is that different types of nerves are involved. Somatic neuropathy often involves large nerves coated with myelin—a fatty substance that serves as a kind of insulation for nerves. According to William Kennedy, M.D., professor of neurology at the University of Minnesota in Minneapolis, myelinated nerves conduct nerve impulses quickly, on the order of



why diagnose it?" says Aaron Vinik, M.D., Ph.D., director of the Strelitz Diabetes Research Institutes at Eastern Virginia Medical School in Norfolk. "It's different now. Now we can do a whole lot."

The most proven method for lowering the risk of all forms of diabetes-related neuropathy, including autonomic neuropathy, is tight blood glucose control. The Diabetes Control and Complications Trial (DCCT), a landmark clinical trial comparing intensive insulin therapy with the standard therapy of the time in 1,441 patients with type 1 diabetes, showed that tight blood glucose control could reduce the prevalence of autonomic neuropathy by 53 percent.

According to Dr. Vinik, treating cardiovascular risk factors in people with diabetes also appears to improve diabetic autonomic neuropathy. A study performed at the Steno Diabetes Center in Copenhagen, Denmark, and reported in January 2003 in the *New England Journal of Medicine*, showed that a multifactorial treatment aimed at improving cardiovascular health in patients with diabetes, also had a beneficial effect on autonomic neuropathy. Autonomic neuropathy progressed far less often in patients treated with exercise, dietary modification, smoking cessation, angiotensin-converting enzyme (ACE) inhibitors, vitamin supplementation, blood glucose control, blood pressure drugs, and lipid-lowering drugs than in patients treated with conventional therapy alone.

#### RESEARCH LEADS TO THERAPEUTIC STRATEGIES

For more than two decades, researchers have experimented with the use of therapeutic agents that might prevent or reverse some forms of neuropathy. One class of drugs called aldose-reductase inhibitors (ARIs) generated quite a bit of excitement more than a decade ago when they were shown to prevent neuropathy in animal models of diabetes. However, when the ARIs were tested in humans, they were found ineffective and were, in fact, unacceptably toxic.

"What happened was that the first observations suggested that ARIs were such a magic bullet in rats that they would have remarkable effects in people, so many rushed to try them out," recalls Robert E. Schmidt, M.D., Ph.D., director of the Division of Neuropathology at Washington University School of Medicine in St. Louis. "One of the difficulties with these agents is that they would cause some people to become ill. And there was also little knowledge

5 to 60 meters per second, which allows us to perform quick, coordinated tasks like playing the piano. Unmyelinated fibers, such as autonomic nerves, conduct impulses at about 1 meter per second—and have been very difficult to study.

"Autonomic neuropathy has been harder to study in the structural sense," says Robert E. Schmidt, M.D., Ph.D., at Washington University School of Medicine in St. Louis. "When scientists were first looking to understand the pathology of diabetes-related neuropathy, they started with the nerves they could get to, such as the sciatic nerve. They would look at those nerves with techniques particularly well suited to studying myelinated fibers. They're much larger and easier to work with, and you can count them in an automated way. Yet, in the autonomic nervous system, even in those nerves that people have been studying for a long time, working with these unmyelinated fibers has proven to be difficult."

## GENITOURINARY EFFECTS

Diabetic autonomic neuropathy can affect the genitourinary system (the bladder and sex organs), causing a host of problems in both men and women.

**SYMPTOM:** A network of nerves signal the brain that the bladder is full, control contraction of the bladder for passing urine, and control the urinary sphincter, which normally opens to allow urination and closes again after urination. Damage to these nerves from autonomic neuropathy can cause less frequent urination, difficulty in completely emptying the bladder, and—because stagnant urine is an excellent breeding ground for bacteria—frequent urinary tract infections.

**TREATMENT:** Bladder dysfunction can be treated with self-help measures such as drinking plenty of fluids, using the bathroom every few hours whether the bladder feels full or not, and pressing against the bladder to start the flow of urine. Drugs that relax the sphincter muscles are available; and, if a urinary tract infection is present, antibiotics are usually effective.

**SYMPTOM:** In men, autonomic neuropathy can cause erectile dysfunction and retrograde ejaculation. A number of factors, such as vascular disease and metabolic control, may contribute to erectile dysfunction. Autonomic neuropathy may interfere with the nerves that allow various blood vessels to widen and constrict in order to create an erection.

**TREATMENT:** Erectile dysfunction may be treated with oral drugs such as Viagra, penile injections, vacuum constriction devices and, as a last resort, penile implants.

**SYMPTOM:** Autonomic neuropathy may also interfere with women's sexual function, causing vaginal dryness and painful intercourse.

**TREATMENT:** Women's sexual dysfunction may be treated with lubricating creams and gels.

Yet, according to Dr. Kennedy, research investigation into autonomic nerves is beginning to change with the advent of immunologic staining methods. For example, over the past decade, he and other researchers have been taking punch biopsies of skin to study the small, unmyelinated nerve fibers within skin that convey pain perception.

More recently, Dr. Kennedy has used these same methods to study autonomic nerves in the gastrointestinal tract, where nerve damage can lead to gastroparesis and delayed stomach emptying.

"We're trying to pin down some very reproducible tests, not only to diagnose gastroparesis, but also to quantify it," says Dr. Kennedy. "If you have a treatment for gastroparesis, you'd like to be able to show how much it improves things. It's pretty hard to get a quantitative idea just by asking the patient. We'd like to be able to look at nerves and see whether they're growing back."



## OTHER EFFECTS

**SYMPTOM:** Autonomic neuropathy can affect the body's response to hypoglycemia. Ordinarily, the body responds to low blood glucose levels by secreting less insulin and more glucagon, a hormone that works against the action of insulin. In people with type 1 diabetes, these safety mechanisms are lost. The adrenal gland releases epinephrine, which also raises blood glucose levels and also produces the classic symptoms of low blood sugar (heart palpitations, anxiety, and trembling), but people with autonomic neuropathy and recurring episodes of hypoglycemia may lose their epinephrine response and become unable to tell when their blood sugar levels are falling.

**TREATMENT:** To reverse or cope with hypoglycemia unawareness, diabetes experts recommend scrupulously monitoring blood sugar levels to avoid even mild lows for several days and/or setting target blood glucose levels a little higher.

**SYMPTOM:** Autonomic neuropathy may cause strange alterations in sweating. Normally, the body sweats in order to cool off, but autonomic neuropathy can disrupt the nerves controlling sweat. As a result, people with autonomic neuropathy may sweat less in their hands and feet, and sometimes their face and trunk sweat more profusely to compensate for this diminished sweating. In addition, they may experience intense facial sweating when eating spicy foods (known as "gustatory sweating").

**TREATMENT:** People with diminished sweating may need to avoid extreme heat and extreme humidity and may need to lubricate their skin with oils and creams.

**SYMPTOM:** Autonomic neuropathy may also affect the pupils of the eye, so that they don't properly contract after exposure to light or dilate in response to darkness. This can make it difficult for people to negotiate dark rooms or drive at night.

**TREATMENT:** People with impaired pupillary response should use night lights and use caution when driving at night.

about how much you ought to treat with, or how long, or how to give it, or whether you even had the right agent. So, the disappointment that came from the early studies made people pessimistic."

Still, at least one ARI is currently being tested in clinical trials in sensory neuropathy and may someday be tried in autonomic neuropathy. Meanwhile, scientists have been exploring a number of different agents for preventing or treating diabetes-related autonomic neuropathy. One of the most intriguing is a powerful antioxidant called alpha-lipoic acid. Results from a recent meta-analysis of treatment with alpha-lipoic acid in humans suggest some beneficial effect on neuropathy. Currently, researchers are trying to reproduce these results in longer, multi-center studies called the Nathan I and Nathan II trials.

Another potentially promising substance, according to Dr. Schmidt, is insulin-like growth factor 1 (or IGF-1). In people with

diabetes, blood levels of this naturally occurring hormone are somewhat lower. Dr. Schmidt and colleagues have shown that giving IGF-1 to rat models of diabetes with neuropathy helped restore nerve structure to near-normal levels. However, researchers aren't sure what long-term side effects IGF-1 might have in humans.

"I think we learned a lot from earlier studies," says Dr. Low, who is working on a blueprint for future clinical trials in autonomic neuropathy. "If you're going to try to reverse autonomic neuropathy, you want to start with autonomic neuropathy that is very mild. I think if you look at late-stage diabetic neuropathy, it's not going to work. The \$64,000 question is whether you should be looking at compounds that have multiple mechanisms of action."

Such a strategy is being employed by Eva Feldman, M.D., Ph.D., director of the JDRF Center for the Study of Complications at the University of Michigan in Ann Arbor. She and colleagues will study the effects of three different types of antioxidant drugs—allopurinol, nicotinamide, and alpha-lipoic acid—administered simultaneously to individuals who do and do not have autonomic neuropathy. The research goal is to study the impact of the antioxidants on the development and progression of cardiac autonomic neuropathy.

"Oxidative stress has different arms to its pathway," says Dr. Feldman. "If you use just one drug, you block just one arm of the pathway, but by using three different drugs, we block three different arms of the pathway and increase our chance of success."

Over the course of two years, the Ann Arbor team will assess the development of autonomic neuropathy in a number of ways, including positron electron tomography (PET) scans to visualize blood flow to the heart, as well as tests of heart rate variability and sudomotor function. They will also use a relatively new test in which radioactive tracers are used to assess innervation (the nerve influence necessary to stimulate activity) of the heart muscle.

"It's a highly quantitative measure of sympathetic innervation in cardiac autonomic neuropathy," Dr. Feldman explains. "In previous studies, we've actually seen a return of innervation with good blood glucose control using these methods. So, it's going to be an extremely sensitive method for showing whether the intervention we've proposed will stop the progression or even cause an improvement in neuropathy."

## WORDS TO THE WISE

Experts in the field of autonomic neuropathy emphasize the importance of catching the condition early in the course of the disease, when it is most treatable. According to Dr. Vinik, people with diabetes need to be aware that some conditions and problems seemingly unrelated to diabetes may actually indicate autonomic neuropathy. He strongly recommends that anyone with symptoms suggesting autonomic neuropathy ask their physician to test for it.

With early identification, diabetes specialists can now take steps to slow the progression of autonomic neuropathy and aggressively treat symptoms and conditions before serious problems develop. "Once we know a patient is susceptible, we can do a lot to prevent and/or treat autonomic neuropathy in all of its manifestations," Dr. Vinik emphasizes. ●



## **Arthritis and Diabetes**

### **Seven Things You Need to Know about Arthritis and Diabetes** By Sandra Gordon

Over half of the nearly 24 million Americans with diabetes also have osteoarthritis. It's the most common kind of arthritis, which occurs when the cartilage that provides a cushion between bones wears away, causing inflammation, stiffness, and pain in joints. One disease affects the other. "Controlling arthritis is critical to diabetes management and vice versa," says John H. Klippel, M.D., the president and CEO of the Arthritis Foundation in Atlanta. Staying active and at a healthy weight are key. Here are seven important facts that can help you manage both conditions to help you stay healthier.

#### **Weight gain makes osteoarthritis worse.**

Because of body mechanics, every pound you gain over your ideal body weight can cause a force on your hips and knees that's four times greater. But even just a little weight loss goes a long way to reduce the wear and tear on those major weight-bearing joints. In losing just 10 pounds, for example, you'll decrease the force on your joints with each step by 40 pounds. To reduce the risk of osteoarthritis, minimize pain, and help prevent the disease from progressing, keep your weight in check or lose weight if you need to by watching portion sizes and being as physically active as you can. Losing weight and regular exercise can also help manage your diabetes.

#### **Age increases risk.**

Although you can get osteoarthritis at any age, the older you become, the greater your chances of developing the disease. The majority of osteoarthritis sufferers are over age 45. If you're overweight, you're at risk of developing the disease even earlier. You're also more likely to get osteoarthritis if you injured a joint at some point in your life or if the disease runs in your family. Like diabetes, the tendency for osteoarthritis can be inherited.

#### **Exercise reduces arthritis joint pain.**

Over time, physical activity actually reduces the pain of osteoarthritis surrounding an ailing joint and can be just as effective as taking pain medication. That's because stronger muscles protect joints by absorbing the force placed upon them. They also help hold joints in a better position so they don't wear out as quickly. Moreover, exercise helps keep your joints flexible. Focus on activities that strengthen the muscles surrounding an ailing joint, such as walking, swimming, and cycling, including using a stationary bike. Dr. Klippel recommends starting by walking for 30 minutes every day; you can break it up into three 10-minute increments. Besides bolstering your joints, regular exercise helps with weight and blood sugar control.

#### **Too much exercise can worsen osteoarthritis symptoms.**

Don't overdo it. Just like too little exercise, too much physical activity can make the disease worse. To prevent overuse or further injury, monitor your pain level to make sure you're not pushing yourself too hard. If it hurts to walk the day after taking a long hike, for example, take a break from walking that day but not from exercise.

(Next)

## **Arthritis and Diabetes, Continued**

Try swimming or cycling on a regular or a stationary bike. Both types of activity are joint friendly and can help you stay active consistently. If you need help developing or sticking with an exercise program, consider working with a certified personal trainer or a physical therapist.

### **Osteoarthritis drugs won't make your diabetes worse.**


To manage joint pain, ask your doctor about taking medication such as Tylenol (acetaminophen). It relieves pain and the side effects are minimal. If that doesn't help, your doctor may recommend taking non-steroidal anti-inflammatory drugs (NSAIDs), such as Advil or Aleve. None of these common pain relievers should affect your blood sugar, but be sure to take them as directed in the correct dosage to minimize or avoid side effects.

### **Taking glucosamine/chondroitin may help relieve arthritis pain.**

"This popular over-the-counter nutritional supplement for osteoarthritis sufferers is marketed as helping to relieve pain and keep the cartilage you have left healthier," says Mary I. O'Connor, MD, chair of the department of orthopedic surgery at the Mayo Clinic in Jacksonville, Florida. She notes that the scientific data is not strong regarding how effective these nutritional supplements are, but there is some evidence that pain can be decreased in those with moderate arthritis. If you want to try glucosamine/chondroitin, Dr. O'Connor recommends taking it for two months to see if you notice a difference.

Because glucosamine/chondroitin has been known to raise blood sugars, play it safe by monitoring your blood sugar level closely. And ask your doctor for a glucosamine/chondroitin brand she recommends. Nutritional supplements aren't regulated by the Food and Drug Administration like prescription medication is so it's tough to know what you're really buying.

### **Worn-out joints can be replaced, but you'll need to be fit for surgery.**

If your X-rays show there's little to no cartilage cushioning your joints and everyday activities such as walking around the block, driving your car, or taking the stairs are extremely painful even with medication, you may be a contender for joint replacement (arthroplasty). The surgery, which can replace worn-out hips, knees, and shoulders with a prosthetic, can make walking and more rigorous physical activity possible again and pain-free. To be a candidate for this procedure, you'll need to have your blood sugar under good control. Managing your blood sugar well will help reduce your risk of infection after the surgery. Exercise before surgery is also important. Strong muscles can speed recovery from the operation so you can get back on your feet faster. 

## Feeling Full: Gastroparesis

This nerve disorder can leave your stomach out of sync

By Erika Gebel, PhD



Almost everyone knows the uncomfortable ache that comes from eating too much: You feel stuffed. But for some people with diabetes, a full sensation may have nothing to do with overindulging. Instead, it may be a sign of a serious complication called gastroparesis. Never heard of it? It's not uncommon; symptoms of gastroparesis have been reported in 5 to 12 percent of people with diabetes. Here's what you need to know about preventing and treating this complication before it creates more serious problems.

In normal digestion, food leaves the stomach and makes its way into the small intestine no more than three hours after eating. However, in people with gastroparesis this journey is delayed and food remains in the stomach longer than it should, leading to a variety of symptoms.

The most common symptoms of gastroparesis are feeling full early in a meal, upper abdominal pain, heartburn, erratic [blood glucose](#) levels, nausea, bloating, and vomiting of undigested food. If food lingers in the stomach too long, it may fuel bacterial overgrowth or form hard lumps called bezoars, which can cause a dangerous blockage. Severe gastroparesis can lead to malnutrition and weight loss.

### **Surprising Origins**

Gastroparesis is most common in people who've had diabetes for longer than 10 years and affects those with both types 1 and 2. It is often found in people with microvascular complications: [retinopathy](#), [nephropathy](#), and [neuropathy](#), diseases of the eyes, kidneys, and nerves, respectively.

The cause of diabetic gastroparesis is rooted in the nervous system. Movement of food through the digestive tract is governed by nerves that send signals from the brain for digestive muscles to contract; these contractions maneuver food from the stomach into the small intestine. Yet unchecked neuropathy can cut off the signals that keep food flowing, leading to gastroparesis.



Because the symptoms of gastroparesis may have other causes, a doctor will run some tests to diagnose this disease. First, he or she may want to rule out an obstruction as the cause of digestive problems. Then, if gastroparesis remains a possibility, the doctor will probably measure the rate at which foods leave the stomach.

The best way to detect gastroparesis is a technique called scintiscanning. The patient eats a meal containing traces of radioactive particles, and as digestion occurs, the emitted radiation is tracked. If, after four hours, more than 10 percent of the meal remains in the stomach, that is considered abnormal and may signal gastroparesis.

### **Glucose Matters**

Neuropathy can be prevented with good blood glucose control, so bringing blood glucose levels down to prevent further damage to the nerves is the first step in managing gastroparesis. Plus, high blood glucose itself can delay food in the stomach, which is another reason to get control. Unfortunately, though, gastroparesis can make blood glucose more difficult to control. Since, with gastroparesis, it may take hours after eating for food to enter the small intestine—where glucose is absorbed into the body—blood glucose levels may behave erratically, spiking or dropping at unanticipated times. Diabetes treatments may need to be adjusted to accommodate gastroparesis.

Some diabetes medications, including [pramlintide acetate \(Symlin\)](#) and [exenatide \(Byetta\)](#), may delay gastric emptying. These medications, and others that can delay food from moving out of the stomach, may need to be used with caution, if at all, in people with gastroparesis.

While gastroparesis usually is a chronic condition, numerous therapies can improve its symptoms and ensure proper nutrition. Gastroparesis can vary widely in its severity, and therapy should of course be tailored by a doctor to the particular case.

Minor cases can often be treated through simple dietary changes. Eating six small meals a day instead of three bigger ones may help with feeling overly full. Doctors may also recommend cutting down on high-fat foods, which slow digestion, and high-fiber foods, which can be difficult to digest. In more severe cases, a liquid or pureed diet may be necessary.

Prescription medications may help relieve gastroparesis. These meds are usually either prokinetics, which act on the central nervous system to increase contractions of the intestines, or antiemetics, which reduce nausea and vomiting. Other gastroparesis treatments under study include botulinum toxin injections and electrical stimulation of the stomach. If all else fails, surgically installing a feeding tube allows nutrients to be fed directly into the small intestine, bypassing the stomach.

While treatments generally can't cure gastroparesis, therapies can often keep people with this complication of diabetes healthy and comfortable. And if you don't have gastroparesis, avoiding it is certainly one more compelling reason to keep blood glucose levels under control.

## 7 Ways to Treat Joint Conditions Common with Type 1 Diabetes

A certified diabetes educator discusses frozen shoulder, trigger finger, diabetic stiff hand syndrome, and carpal tunnel syndrome.



**Jennifer Smith | February 20th 2017**

**Q: My shoulder has been stiff and it aches a lot lately. I've had diabetes for a number of years – is there a relationship between painful joints and diabetes?**

**A:** As we get older, most people experience some degree of stiffness in joints, but having diabetes raises the risk of serious joint health problems. Tendons and ligaments are mostly made of collagen, a protein that is supposed to be flexible like

a soft rubber ball. If collagen stiffens, joints will not work as well, and pain may be a symptom. Research has found that high blood glucose levels change the balance of proteins in collagen, and this causes an increased risk of stiffness. Other researchers also have suggested that both diabetes and joint disease could come from the same inflammatory process.

sponsor

Four well-known diabetes-related joint conditions are:

**Adhesive Capsulitis (also known as Frozen Shoulder)** – a condition in which the range of motion of the shoulder joint is severely restricted. According to the American Diabetes Association, this condition affects 20 percent of people with diabetes and 5 percent of the general population. This typically starts with shoulder pain and inflammation and can progress to stiffness and near-complete immobility. It can resolve and get better, especially with treatment, typically within two years.

**Trigger Finger** – a condition where one or more fingers curl up, making it difficult to straighten. Tendons that allow the fingers to bend and straighten “catch” and then may suddenly “click” open again. This condition can be painful and is worse in the morning. Jobs or home duties that require repetitive gripping motions can bring on the onset of this condition or make it worse.

**Diabetic stiff hand syndrome** – a painless disorder caused by an increase in collagen in and just below the skin. It can sharply limit hand function.

**Carpal Tunnel Syndrome** – a painful condition caused by pressure on the median nerve, which passes into the hand through a narrow “tunnel.” When this tunnel is pinched by ligaments that get thick, severe pain can result. CTS is common with those who do a lot of typing or other repetitive work that keeps wrists in unnatural positions.

### **Prevention and Treatment**

Prevention of these conditions is easier than treatment, but there are things we can do for our joints at any state of health. They include:

sponsor

**Stretching** – Joint stiffness tends to be a vicious cycle. Most often when your body hurts, you rest it. When it comes to joints, this causes them to stiffen up and they hurt more. You then use the joint less, which causes more stiffening and more pain. It is important to break this cycle by moving the joint, even if it hurts a bit (unless there is sharp pain). Talk to your doctor about a referral to a physical therapist who can give you the proper stretches to do to prevent injury and help you feel better.



**Heat and cold applications** – Heat relaxes stiff tendons, while cold reduces pain and swelling. You might want to alternate them or explore to see which works better for you.

**Pain medicines** – If needed, anti-inflammatory medicines like ibuprofen can help. Sometimes you need to take these to be able to stretch.

**Massage** – This has been shown to calm spasms and reduce pain by bringing in a fresh supply of oxygen and nutrient-rich blood, and by flushing the area of chemical irritants that come from inflammation. Massage may need to be avoided when joints are hot, swollen, or tender to touch.

**Improve blood glucose control** – Since research has shown that the effect of high blood glucose contributes to inflammation, it can help to bring glucose levels into range. It will prevent further injury and aid with healing as you get therapy.

**Physical therapy** – Therapists have an amazing variety of equipment and knowledge to help stiff and painful joints. These include ultrasound, fluid therapy, paraffin treatments, and many others.

**Splinting** – If you wake with curled fingers from trigger finger, you might try sleeping in finger splints to keep them straighter.

As always, don't try to manage this alone. Talk with your doctor and/or a physical therapist about your condition.

# Physical Complications Associated with Diabetes

Cognitive Function: Reduced blood flow to brain, memory impairment

Hearing loss

Vision: Macular Edema, Diabetic Retinopathy, Dry Eye, Glaucoma, Cataracts

Nervous System: Peripheral Neuropathy, Diabetic Neuropathy, Autonomic Neuropathy, Neurogenic Bladder, Anodyne

Oral: Gum Disease, Halitosis

Heart/Vascular: Congestive Heart Failure, Heart Disease, Endothelial Dysfunction, Peripheral Vascular Disease, Hypertension

Kidneys: Diabetic Kidney Disease

Digestive: Gastroparesis, Fatty Liver

Muscle/Bone: Carpal Tunnel, Charcot Foot, Frozen Shoulder, Flexor Tenosynovitis, Stiff Hands, Trigger Finger

Sex & Intimacy: ED, Female Sexual Dysfunction

Skin: Bullosis Diabeticorum, Necrobiosis Lipoidica Diabeticorum ("NLD"), Acanthosis Nigricans, Diabetic Dermopathy, Eruptive Xanthomatosis

Sleep Issues: RLS - Restless Leg Syndrome

Feet: Charcot Foot