Staying healthy with diabetes

Blood glucose (or "blood sugar") is the fuel that gives your body energy

When you eat, your body digests the food and turns some of it into a special type of sugar called "**blood glucose**" (also called "blood sugar").

Your blood vessels carry blood glucose to cells in all parts of your body where it can be used for energy.

With diabetes, blood glucose can build up in your blood and make your blood glucose too high

To give your body energy, blood glucose needs to move from your blood into the rest of your body. Normally, this happens easily. But if you have diabetes, it does **not** happen easily:

- Having diabetes means that it is hard for glucose to move from your blood into the cells of your body the way it is supposed to.
- When glucose does not move easily from your blood into the rest of your body, *too much glucose stays in your blood*. Your level of blood glucose gets too high and your cells are starved for energy.

What can happen if your level of blood glucose stays too high?

If your blood glucose stays too high for a long time, it can cause serious health problems. These health problems are called "complications" of diabetes. Here are some complications that high blood glucose can cause:

- **Nerve damage**

  High blood glucose can damage nerves throughout your body, causing numbness or tingling. Nerve damage is especially common in feet and hands.

- **Damage to your heart and your kidneys**

  High blood glucose can damage the blood vessels that lead to your heart. This damage can cause heart disease and heart attacks. High blood glucose also damages the blood vessels in your kidneys. This weakens your kidneys and can eventually cause them to stop working.

- **Damage to your eyes and vision**

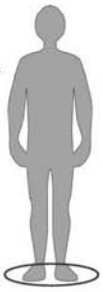
  Your eyes have tiny blood vessels that can be easily damaged by a high level of blood glucose. This damage can lead to blindness.

(more on the next page)

(complications of diabetes, continued)

- **Sores on your skin that are slow to heal and can become infected easily**

  High blood glucose makes it harder for a sore to heal. Sores are especially common on feet.



- **Gum disease and tooth decay**

  High blood glucose damages the blood vessels that normally help keep your gums and teeth healthy. Having extra glucose in your blood makes gum infections worse.

How can you stay healthy with diabetes?

Keep your blood glucose at the right level

Keeping your blood glucose at the right level — not too high and not too low — helps prevent the complications of diabetes. *Here are tips:*

- **Watch what you eat**

  To keep your blood glucose at the right level, you need to **eat the right kinds of food,** in the **right amounts,** at the **right times**. Different foods affect your blood glucose in different ways. Ask your doctor for information on healthy eating and how to get help from a nutritionist.

- **Get regular exercise**

  Staying active is one of the best ways to help keep your blood glucose under control.

- **Follow instructions for using medicine and checking your blood glucose**

  If you need to test your blood, your doctor will give you instructions and tell you what to do if your blood glucose gets too high or too low.

Get regular checkups

The tests and exams you get at your checkups help you know how well you are doing at keeping your blood glucose at the right level. Getting regular checkups helps catch complications of diabetes at an early stage, when they are easier to treat. *Here is what your checkups should include:*

- **Blood pressure** and blood tests, including a **cholesterol test** and an **"A-1-C" blood test** (this test tells what your average blood glucose has been during the past 2 to 3 months).
- A test to find out how well your **kidneys** are working.
- A **"dilated" eye exam.** This exam checks on whether there has been any damage to the blood vessels in your eyes. (This exam is not the same as the type of eye exam you get for glasses or contact lenses.)
- A **foot exam** that checks for nerve damage, sores, and other problems.

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Blood glucose, insulin, and Type 1 diabetes

Blood glucose is the fuel that provides energy for your body

When you eat, your body digests the food and turns some of it into "blood glucose." Blood glucose is sometimes called "blood sugar."

Your blood vessels carry blood glucose throughout your body and your cells use it for energy.

To be able to use blood glucose for energy, your body must have insulin

"Insulin" is a substance produced naturally inside the body by an organ called the "pancreas." Insulin is needed to help move blood glucose from the blood into other parts of the body where it is used for energy.

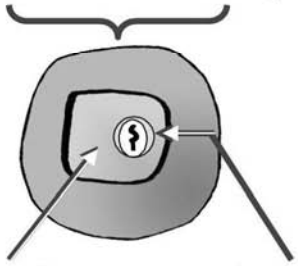
When you have Type 1 diabetes, your body does not make insulin

For people who do not have diabetes, the body makes as much insulin as it needs. But when you have Type 1 diabetes, your body does not make its own insulin. Since your body must have insulin, you have to inject it.

Insulin works with cells of your body like a key works with a lock

The pictures below explain why you need insulin and how it works in your body. The pictures show comparisons to a lock and key.

There are many trillions of cells in your body. Imagine that the drawing below is one of the cells in your body.

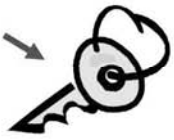


This "door" into the cell is closed and locked.

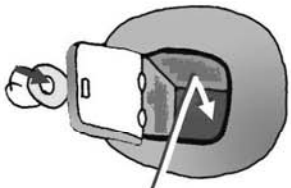
The right key in this "keyhole" will unlock the door.

To let blood glucose into the cell, the door to the cell has to be unlocked.

Insulin is the "key" that unlocks the door.



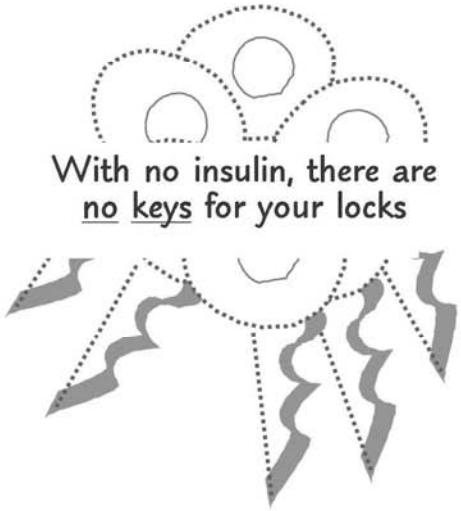
If the insulin "key" works in the lock, the door will open.



When insulin unlocks the cell, glucose can move from the blood into the cell to provide energy.

more on the next page →

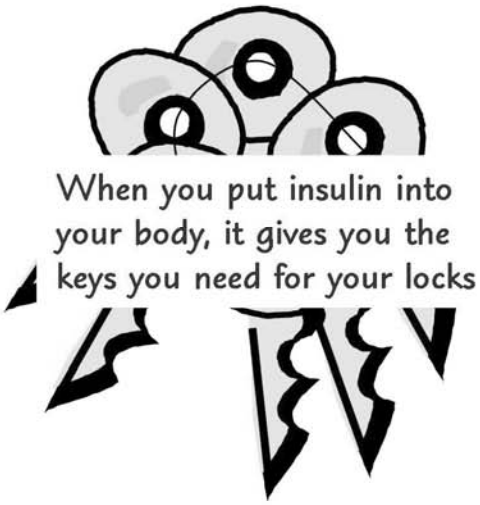
When you have Type 1 diabetes:



When you have Type 1 diabetes, your body does not make its own insulin.

With Type 1 diabetes, your body does not make any insulin "keys." Without the insulin "keys" there is no way to unlock the cells of your body to let in the blood glucose.

Because blood glucose cannot move from your blood into your cells, the blood glucose stays in your blood. The blood glucose level in your blood can quickly get very high. This leads to severe problems in your body, putting your life in danger.



When you have Type 1 diabetes, you must inject insulin into your body.

Your body must have insulin in order to live. If your body does not make its own insulin, you need to **inject insulin into it.** This gives your body the insulin "keys" it needs.

When you have Type 1 diabetes, you can lead a long, healthy life.

- See your doctor and other health providers regularly.
- Check your level of blood glucose to be sure it's at a healthy level.
- Eat healthy foods and stay active.

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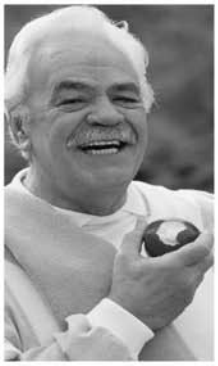
Blood glucose, insulin, and Type 2 diabetes



When you eat, your body digests the food and turns some of it into "blood glucose."

Blood glucose is the fuel that provides energy for your body

Blood glucose is sometimes called "blood sugar." Your blood vessels carry blood glucose throughout your body and your cells use it for energy.

To be able to use blood glucose for energy, your body must have insulin

"Insulin" is a substance produced naturally inside the body by an organ called the "pancreas." Insulin is needed to help move blood glucose from the blood into other parts of the body where it is used for energy.

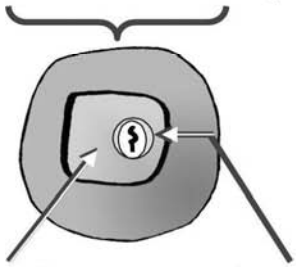
If you have Type 2 diabetes, there's a problem with your insulin

Normally, the body makes as much insulin as it needs. This happens automatically for people who do not have diabetes. But if you have Type 2 diabetes, it means that you have one or more problems with insulin. Your body might not be making as much insulin as you need. Your insulin might not be working as well as it should.

Insulin works with cells of your body like a key works with a lock

The pictures below explain why you need insulin and how insulin works in your body. The pictures show comparisons to a lock and key.

There are many trillions of cells in your body. Imagine that the drawing below is one of the cells in your body.

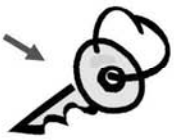


This "door" into the cell is closed and locked.

The right key in this "keyhole" will unlock the door.

To let blood glucose into the cell, the door to the cell has to be unlocked.

Insulin is the "key" that unlocks the door.



If the insulin "key" works in the lock, the door will open.

When insulin unlocks the cell, glucose can move from the blood into the cell to provide energy.

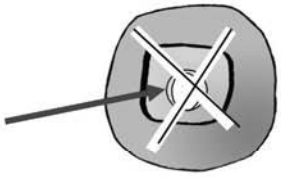
more on the next page →

When you have Type 2 diabetes, you can have *either* or *both* of these two types of problems with insulin:

1 Your body makes insulin, but the insulin does not work as well as it should

Your body is making keys →

-- BUT -- your keys don't work very well at opening the locked doors of the cells in your body



When the keys and locks are not working well together, it's hard for blood glucose to move from your blood into cells of your body the way it should.

2 Your body makes insulin, but not as much as you need

Your body is making some keys →

-- BUT -- you need <u>more</u> keys →

(there are missing keys)

Your insulin "keys" might be working well at opening the locked doors of your cells, but your body doesn't make enough keys to open all of the locks.

When there are not enough keys to open all the locks, it's hard for enough blood glucose to move from your blood vessels into the cells of your body.

Because of these problems with insulin, the level of blood glucose in your blood can get too high

When your blood glucose stays too high for a long time, it can lead to serious health problems. To stay healthy with Type 2 diabetes, you must keep your level of blood glucose under control.

To help control your level of blood glucose, it's important to watch what you eat and to stay physically active. Some people with Type 2 diabetes take medications as well. Be sure to see your doctor regularly and follow your doctor's instructions for checking and controlling your level of blood glucose.

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Keeping your eyes healthy when you have diabetes

If you have diabetes, here are things you need to know:

1. **Having diabetes makes some eye problems more likely.** These eye problems *can be serious* and can even lead to blindness.

2. **There may be no symptoms at first.** Eye problems can develop slowly. Often there are no symptoms to warn you until the damage is severe.

3. **You can help prevent eye problems.** Just because you have diabetes does not mean that you will automatically get eye problems. Here are ways to help keep your eyes healthy:

   - **Get a "dilated eye exam" every year.** This exam is the best way to catch eye problems at an early stage, when treatment can work better. (A dilated eye exam is different from having a checkup for eyeglasses or contact lenses. Page 6 of this handout tells you more.)
   - **Do your best to keep your blood glucose (blood sugar) at a healthy level.**
   - **Do your best to keep your blood pressure at a healthy level.**

4. **If you have eye problems, they can be treated.** The kind of treatment you need depends on what kind of eye problem you have. It's best to find and treat eye problems as soon as you can. Without treatment, your vision could get worse or you could become blind.

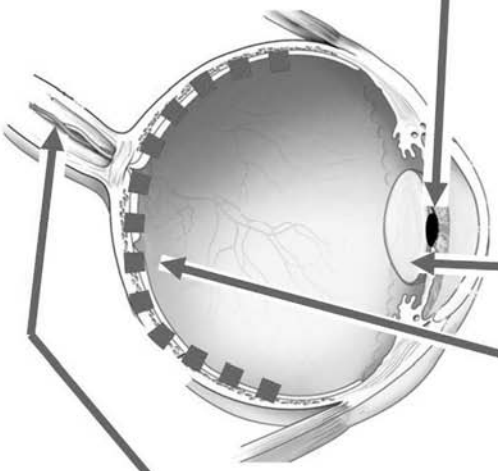
This handout tells about eye problems and how to help prevent them.

What are the parts of the eye?

This handout tells about three kinds of eye problems. Since each problem affects a different part of the eye, we start by showing you the main parts of the eye.

This drawing of a woman shows a **side view** of one of her eyes.

The picture below is *also* a side view of an eye. It shows a **close-up side view of the entire eye,** including parts of the eye that are inside the head.



Pupil The pupil is at the front of your eye. It looks like a black circle in the center of your eye. Light comes into your eye through your pupil.

Lens The lens of your eye is right behind the pupil. Light comes through the lens and the lens helps focus what you see.

Retina ("Retina" is pronounced "RET-tin-uh.") The retina is a layer of nerves at the back of your eye. It senses the light that comes into your eye. In this picture, the retina is marked with a line that looks like this: ■ ■ ■ ▮

Optic nerve "Optic" is pronounced "OPP – tick" and it means "eye." The optic nerve is the main nerve of your eye. It is at the back of your eye. It carries the signals to your brain that allow you to see.

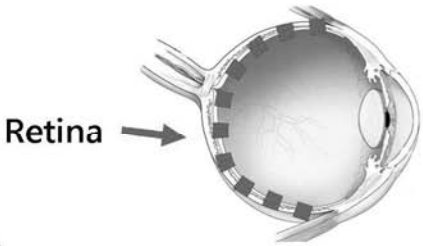
What eye problems are a concern when you have diabetes?

This handout tells you about three types of eye problems that can result from having high blood glucose:

- The first is called "**diabetic retinopathy**." ("Retinopathy" is pronounced "ret-tin-AH-path-ee.") As you can tell from its name, diabetic retinopathy is mainly a problem for people with diabetes.
- The other two eye problems are **cataracts** and **glaucoma.** These eye problems are a special concern for people with diabetes. (People who do *not* have diabetes can also get cataracts and glaucoma.)

What is "diabetic retinopathy"?

Diabetic retinopathy is the *most common* eye problem for people with diabetes. It involves **damage to the blood vessels in the retina.**



- Sometimes the blood vessels swell and leak fluid. Sometimes abnormal new blood vessels grow on top of the retina.
- These changes in the blood vessels in the retina can lead to vision loss or blindness. To see how having diabetic retinopathy can affect vision, compare the two pictures below:

1

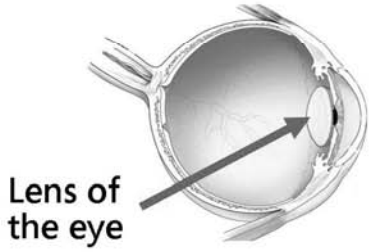
Here is how two boys look to a person who has normal vision:

2

Here is how the *same boys* look to a person who has diabetic retinopathy:

What are "cataracts"?

Cataracts **affect the lens of your eye,** making the things you look at seem **blurry.**



- The **lens** is at the front of your eye. It focuses light on your retina.
- Usually the lens of your eye is clear, but if you have a cataract, the lens turns cloudy.
- When the lens turns cloudy, it makes your vision blurry. To see how having cataracts can affect vision, compare the two pictures below:

1

Here is how two boys look to a person who has normal vision:

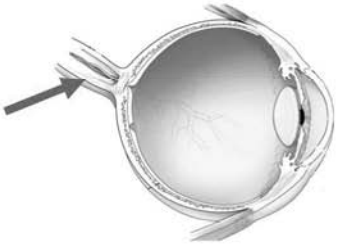
2

Here is how the *same boys* look to a person who has cataracts:

- To help you see clearly again, cataracts can be removed by surgery.
- Anyone can get cataracts. But **if you have diabetes, you are more likely to get cataracts at a younger age**.

What is "glaucoma"?

When you have glaucoma, **pressure builds up inside your eye and damages the optic nerve.**



- The optic nerve carries signals to the brain that help you to see. When your optic nerve gets damaged, it causes vision loss. To see what the vision loss from glaucoma is like, compare the two pictures below:

1

Here is how two boys look to a person who has normal vision:

2

Here is how the *same boys* look to a person who has glaucoma:

- At first, the vision loss from glaucoma is just from the sides of your eyes, as shown in photo #2 above. But if you have glaucoma and it is not treated, it can lead to blindness.
- If you get regular eye exams, it is easy to catch glaucoma at an early stage. When you find glaucoma early, it's usually easy to treat.
- Anyone can get glaucoma. But **people who have diabetes are nearly twice as likely to get glaucoma** as other adults.

Help keep your eyes healthy!

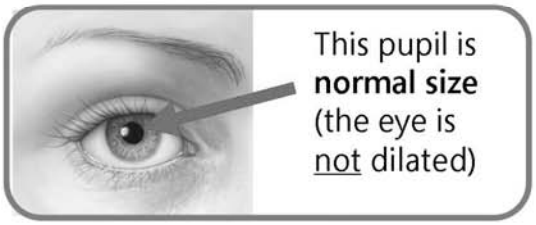
Don't let eye problems take your vision away.

The rest of this handout tells you what you can do to help keep your eyes healthy.

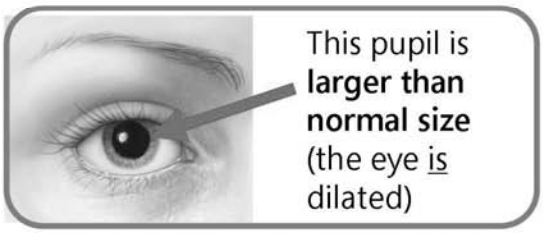
To help find eye problems at an early stage, get a "dilated eye exam" at least once a year

- A dilated eye exam **checks for damage to the blood vessels in your eyes**. It's best to find damage to blood vessels at an early stage when treatment can work better.
- **This exam is <u>not</u> the same as the eye checkup you get for glasses or contact lenses**. Instead, it's a special type of eye exam for people with diabetes that lets your doctor get a good look at the blood vessels in your eyes.
- When you have a dilated eye exam, you will be given **eye drops to "dilate your eyes."**
- "Dilate" means to get bigger. As shown in the pictures below, the eye drops make your pupils get bigger (the pupil is the dark center of your eye).

This woman is getting eye drops to <u>dilate</u> her eyes.



This pupil is **normal size** (the eye is <u>not</u> dilated)



This pupil is **larger than normal size** (the eye <u>is</u> dilated)

When your pupils get larger, **your eye doctor can get a much better view of the inside of your eyes**. This makes it easier to check for possible damage to blood vessels in your eyes.

How often should you get a dilated eye exam?

- **If you have no symptoms, get a dilated eye exam once a year**

  Even if you see just fine and your eyes seem fine, you could have some damage in your eyes.

  Eye problems can develop slowly. You may not notice any symptoms until the damage is already serious.

  So be sure to get a dilated eye exam at least once a year. This exam is the best way to catch eye problems at an early stage when treatment will work better.

- **If you notice symptoms, get a dilated eye exam right away**

  If you feel that something is changing or seems wrong with your eyes, make an appointment for a dilated eye exam.

  Signs of possible eye problems could include blurry vision or if you have trouble when you are reading. You may also notice things such as rings around lights, dark spots, or flashing lights.

Do your best to keep your blood glucose (blood sugar) as close to normal as you can

When your blood glucose stays too high for a long time, it can cause serious damage to your body. This damage can include eye disease.

Controlling your blood glucose is the best way to keep your eyes healthy. Talk with your health care team about your blood glucose numbers and ask what numbers you should aim for. They can help you find a way to keep your blood glucose under control.

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Illustrations are adapted from images provided by the National Eye Institute, U.S. National Institutes of Health.

The A-1-C blood glucose test: what it is and how it can help you

Oregon Diabetes Resource Bank
Handouts to help people with diabetes

I tell my patients that knowing their A-1-C number will help them stay healthy with diabetes. If the number is too high, we talk about what they can do to get their blood glucose down to a lower level to help protect their health.

What is the "A-1-C" test?

A-1-C is pronounced "A - one - see." The A-1-C test is also called the hemoglobin A-1-C test.

The A-1-C test is a simple test for blood glucose (or "blood sugar") that you get at your doctor's office.

The result from the A-1-C blood test tells how high your average blood glucose has been during the past two to three months.

Who needs the A-1-C test?

Everyone who has diabetes needs to get this test, even if they test their own blood glucose at home.

Most people with diabetes should get the A-1-C test *at least two times a year*. Ask your doctor how often you should get the A-1-C test.

What is your "goal" for the result of your A-1-C test?

The A-1-C goal for people with diabetes is *usually 7 or less* (6.5 is a common goal for the A-1-C number).

If your A-1-C number is higher than 7, it means that your blood glucose has been staying *too high* during the last couple of months. When your blood glucose stays too high for a long time, it can damage blood vessels throughout your body.

When high blood glucose damages your blood vessels, it can lead to *serious health problems*. These problems include:

- damage to your kidneys that can make them stop working
- eye problems that can lead to blindness
- sores and skin infections of the feet that can lead to amputations
- heart disease
- nerve damage

What can you do to stay healthy?

No one wants the health problems caused by high blood glucose, and *you don't have to have them!* Keeping your blood glucose at a healthy level will help prevent these problems.

More on next page →

What is "blood glucose"?

Your body changes food you eat into "blood glucose." Blood glucose is also called "blood sugar."

Your blood vessels carry the blood glucose throughout your body to give your body energy.

In order to give your body energy, the blood glucose has to move from your blood into the rest of your body. For people who do *not* have diabetes, this happens easily.

But if you have diabetes, **it's hard for the glucose to move from your blood to other parts of your body the way it should.** So too much glucose may stay in your blood instead, and this is not good for your body:

- Your blood vessels will have too much glucose, which **causes damage**.
- The rest of your body will not get as much glucose it needs, so it will be **starved for energy.**

Often there are no symptoms to warn you when your blood glucose is too high

To know for sure whether your blood glucose is at a healthy level or too high, **you have to test your blood**. That's why it's so important for you to get your A-1-C blood glucose tests.

Your A-1-C tests

You and your doctor can fill this in:

You should have an A-1-C test:

- ☐ Every 6 months (2 times a year)
- ☐ Every 4 months (3 times a year)
- ☐ Every 3 months (4 times a year)
- ☐ Other: _____

Your A-1-C goal is _____

Your A-1-C numbers are:

Date _____ A-1-C = _____

Date _____ A-1-C = _____

Date _____ A-1-C = _____

6 → An A-1-C of 6 is **normal** for blood glucose

7 or less → For most people with diabetes, the **goal is an A-1-C of 7 or less** (6.5 is a common goal)

Higher than 7 → When your A-1-C number is *higher than 7*, this means that *your blood glucose is staying too high.*

- When your blood glucose stays too high, you have a greater chance of getting serious health problems.
- The next page has tips on how to get your blood glucose down to a healthier level. →

What should you do if your A-1-C test shows that your blood glucose is too high?

- **Talk with your doctor** and other members of your health care team about what to do. They can suggest changes that will help you bring your blood glucose down to a healthier level.

  Here is a place for you to write down changes you plan to make:

  _____

  _____

  _____

  _____

- **Eat the *right foods* in the *right amounts* at the *right times*.**
  - Different foods affect your blood glucose level in different ways.
  - To learn more about how eating affects your blood glucose, talk with your health care team. Ask how you can get help from a nutritionist.

- **Stay active**. Exercise is a great way to get better control over your blood glucose. Get regular physical activity as advised by your health care team.

- **Take your diabetes medicines** if any have been prescribed for you.

Testing your own blood

Everyone with diabetes needs to have an A-1-C test at least two times a year. *But to help manage their blood glucose from day to day*, many people with diabetes *also* test their own blood at home. You can use a blood glucose kit or meter and you will get the results right away.

Ask your doctor about whether you should test your blood at home and how often you should do it.

Testing your blood will show you how your blood glucose can change from day to day or hour to hour, depending on such things as what you eat and how much you exercise. This helps you know what lifestyle changes you could make to reach a healthy level of blood glucose.

Keep working toward your goal for a healthy A-1-C number

The closer you can get to a number of 7 or less, the better your chance of preventing or delaying health problems that can happen when you have diabetes.

Research studies show that if your A-1-C number goes down by just one point, this can mean that your risk of long-term complications of diabetes goes down by as much as 40%.

[*Source:* U.S. Department of Health and Human Services' National Diabetes Education Program]

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