CONTINUOUS GLUCOSE MONITORS (CGMs)

TESTING YOUR GLUCOSE LEVELS LETS YOU KNOW HOW MUCH INSULIN TO GIVE.

UNDERSTANDING YOUR GLUCOSE LEVEL AND WHY WE TEST FOR IT

Glucose is another word for sugar. When we talk about glucose levels, we are talking about how much sugar is in your blood. This level is measured in milligrams per deciliter, or mg/dl.

Glucose levels go up and down. This can be due to what a person has eaten, what activities they are doing and how much insulin is in their body.

People with diabetes have to know what their glucose levels are to help them decide how much insulin to take or how much food to eat.

When someone does not have diabetes, an organ in the body called the pancreas makes insulin for the body. The pancreas responds right away to the level of glucose in the blood so it knows how much insulin to make. For example, when the person eats it makes more insulin. When the person is not eating, it makes less insulin.

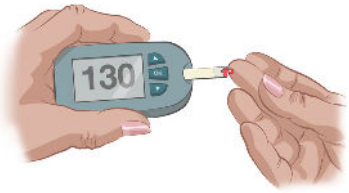
If a person has Type 1 Diabetes, the pancreas doesn't make insulin. So, they need to give insulin with shots or the pump instead.

HOW TO CHECK GLUCOSE LEVELS

Use a Glucose Meter

It used to be that the only way to check glucose level was to prick the skin. The person would squeeze some blood out from the finger tip onto a test strip. Then insert the strip into a glucose meter to check the glucose level.

A glucose meter gives information on what the glucose level is at that moment the blood is tested. It does not say whether the glucose is going up, down or staying the same. The glucose meter does not have alarms to alert someone to a level that is too low or too high.



Use a Continuous Glucose Monitor (CGM)

A CGM is a very different way of testing the glucose level. A CGM lasts 7 to 15 days depending on the type. Then, you remove the one you have been wearing and put a new one a different part of your body. There is also one type of CGM that can stay in the body up to 6 months.

The CGM checks the glucose every 1-5 minutes. With the CGM, you can see your glucose level on a receiver or smartphone without needing to prick your finger. The CGM tells if the glucose level is going up, down or staying the same. A CGM is a better way to check glucose levels because it gives a lot more information!

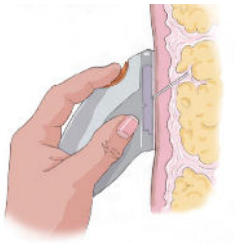
TYPES OF CGMs

Some CGMs have three pieces. Others have two pieces. Most CGMs have a short lasting sensor. One has a long lasting sensor. A sensor is the part of a CGM that is under the skin and measures glucose. CGM systems change over time. Newer models are coming out all the time. Many become easier to use and wear. Others add new features.

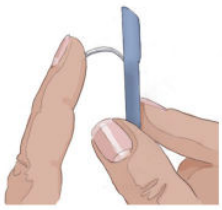
3 Piece Continuous Glucose Monitors

Three piece CGMs have a **sensor, transmitter** and **receiver**.

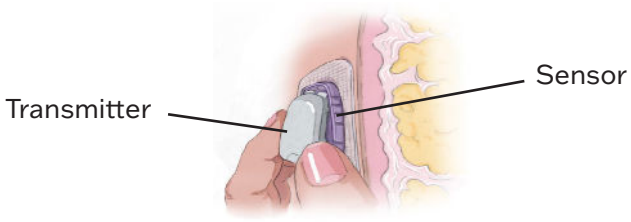
The sensor usually goes on the belly or arm. The sensor comes pre-loaded into a device that injects it under the skin. The device that puts the sensor under the skin is called an inserter. Once under the skin, the inserter is thrown away.



The sensor has a thin wire that goes under the skin. The wire is attached to and covered by a plastic part. The plastic part of the sensor sticks to the skin. This sensor part of the CGM is flat and about the size of an adult thumb print. Most CGM, sensors need to be replaced every 7 to 15 days depending on the type of sensor. The sensor tests the glucose level every few minutes. It then gives the information to the transmitter.



The transmitter is a small device that fits over the sensor. You attach it to the sensor. When you need to change the sensor, you take off the transmitter. The transmitter gets reused by placing it on a new sensor. So, do not throw it away! The transmitter gets the signal from the sensor. It then sends the information to a receiver or a smartphone.



The receiver is the part that gets the signal from the sensor and transmitter so you can see your glucose levels. The receiver that comes with the CGM is about the size of a small smartphone.

You can choose to use the receiver that comes with the CGM, or you can use an app on your own smartphone. Some people use both the CGM receiver and their phone.

Some CGMs can send information to insulin pumps. If you use an insulin pump, you can look at the pump to check glucose levels.

You can see many helpful things on the receiver or phone app. You are able to see your glucose level as a number. You can also see arrows that show if your glucose is going up, going down or staying steady. You can also send your glucose levels to the smartphone of a family member or friend if you want to.

The receiver needs to be close by to receive a transmission. Some devices have a range of 20 feet. Others must be much closer — about 6 feet. You also have to make sure there is not anything between you and the receiver that will block the signal. For instance, it cannot be blocked by a wall.

What is a long lasting sensor for a 3 piece CGM?

The main difference between systems with a short lasting sensor and a long lasting sensor is how you place the sensor on the body. The long lasting sensor requires a small procedure by a trained doctor to put a sensor under the skin. The sensor stays in place for up to 180 days. There is a transmitter that you have to place on top of the skin. Then the signal is sent to a smartphone.

2 Piece Continuous Glucose Monitors

Some systems have only two pieces. This is because the sensor and transmitter are one single piece. When you throw out the sensor, you get rid of the transmitter at the same time. You replace the combo sensor and transmitter every 14 days. The sensor and transmitter unit send glucose information to a receiver or smartphone. The receiver for a two piece CGM is called a reader.

POPULAR CGMs AND THEIR FEATURES

FREESTYLE LIBRE
14 DAY

DEXCOM G6

MEDTRONIC
CONNECT

SENSEONICS
EVERSENSE

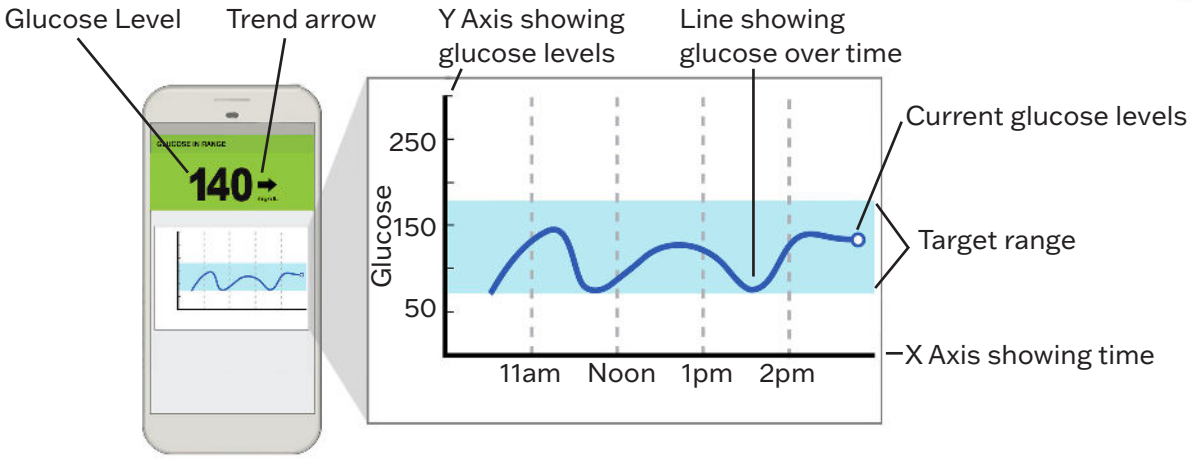
Company	CGM Name	Type	Alarms	Calibrate	Share with others
Abbott	Freestyle Libre 14 day Freestyle Libre 2 Freestyle Libre 3	2 piece	Yes	No	Yes
Dexcom	Dexcom G6 Dexcom G7	3 piece 2 piece	Yes	No	Yes
Medtronic	Guardian Connect	3 piece	Yes	Yes	Yes
Senseonics	Eversense	2 piece	Yes	Yes	Yes

CGMs have different features:

- **Calibration:** Some CGMs need to be calibrated. This means taking a blood glucose reading from a fingerstick. Then you enter your blood glucose number on the meter into the receiver or CGM app on a smartphone. This helps to check that the CGM system is working as it should. Each CGM system has its own rules about how often you need to do finger sticks.
- **Sensor life:** This is how long a sensor should stay under your skin. Most sensors can be used for 7 to 15 days. There is a long lasting sensor that stays under the skin for about 180 days.
- **Sensor warm-up time:** The warm up time is how long it takes for you blood glucose reading to be correct. Some CGMs take longer than others.
- **Transmitters either have batteries or can be charged:** You may need a new transmitter every 3 months. The receiver or your smartphone can also be recharged and these types of systems last years.
- **Display options:** This is how you see your glucose readings. Some CGM systems have their own handheld device called a receiver or scanner. Some can send information to a computer, smartphone or smartwatch. There are two systems that can send information to an insulin pump.
- **Alerts:** If your blood glucose is too high or too low, most CGMs can let you know. Some vibrate or let you know with an alarm sound. You can also customize or set the alerts the way you want them. One system does not have alarms.
- **Live data sharing:** This is a feature where you can share your blood glucose information with someone. They can see your information in real time the same way you can. Some people like to share data with their diabetes care provider to help with diabetes care decisions. Family members may like to see what is happening with their loved one when they are apart.
- **Software and data analysis:** The information from the sensor can be sent or uploaded to software programs. Software programs take the information, or data, from the sensor. The programs analyze the data or turn the data into reports. These reports can be shared with your diabetes care provider. You can also see your own progress too.
- **Costs:** If you have insurance, you will have to check with the insurance company about which CGM systems they cover. You will also have to ask if they cover all costs. If you are paying, there are a few costs to consider. There are separate costs for sensors, transmitters, and receivers.

UNDERSTANDING THE CGM's INFORMATION

You can look at your glucose level on your smartphone or receiver. It can tell you what your glucose level is right now and if your glucose is on the way up or down. It can tell you if you are high, low or within your target range. With this information, you can make decision on what you should do. When you look at your smartphone or receiver you will see a picture that looks like something like this:

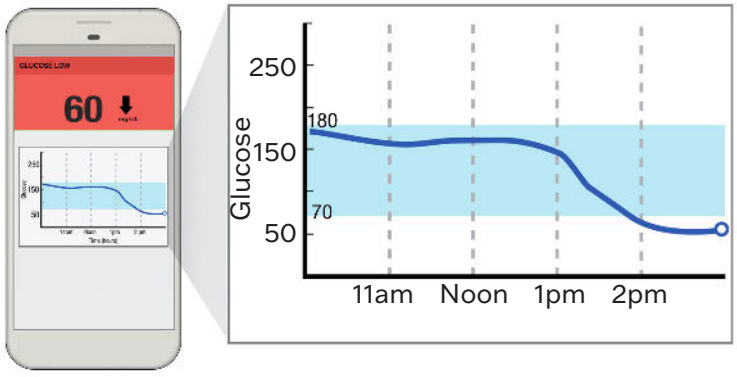


It shows you what your glucose level is right now. In this example the glucose level is 140. It also may tell you what your glucose is likely to do within the next half hour or so. This is done by a trend arrow. Trend means the general direction something is going. In this picture the trend arrow is saying that the glucose is likely to stay the same for about 30 minutes.

The graph will give you more information. It has a wavy line that shows if your glucose level has been going up, down or staying flat. It also shows if your glucose level is within your target range. If the wavy line is inside the colored part it means your glucose is in range.

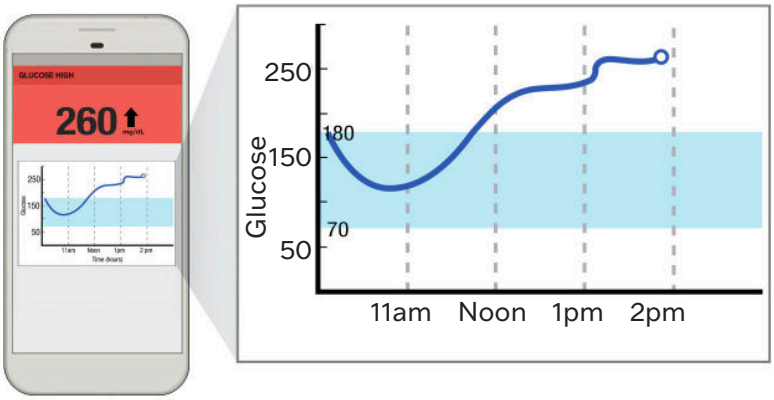
What would my smartphone or receiver look like if I were going low?

Below is an example of low glucose. In this case, the glucose level was in range from 11 am to just before 2 pm. Do you see the line starting to move out of the blue target range color? Do you see the glucose level of 60 mg/dl with the trend arrow pointing down? This would be the time to eat or drink something to bring your glucose up.



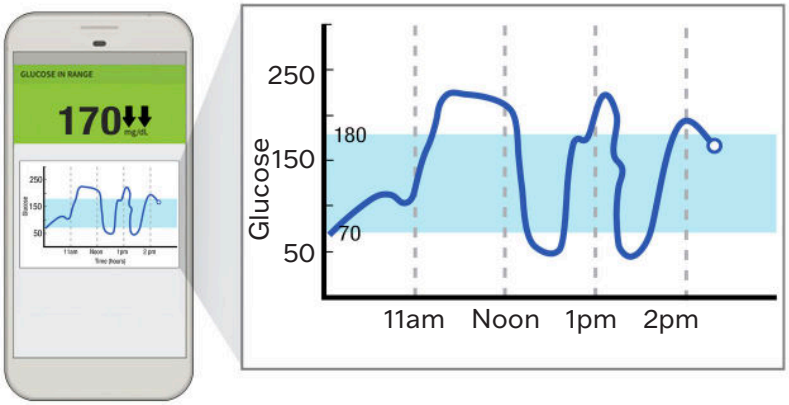
What would my smartphone or receiver look like if I were going high?

Below is an example of high glucose. In this case, the glucose level was in range from 11 am to just before 12 pm. Then the glucose continued to rise. Do you see the line starting to move out of the blue target range color? Do you see the glucose level of 260 with the trend arrow pointing up? This would be the time to give insulin to bring your glucose down.



What would it mean if my graph showed both highs and lows?

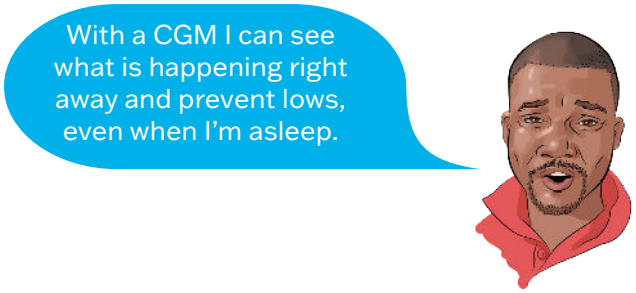
In this example, the glucose started in range then was going up at 11 am. By noon, the glucose was about 190 mg/dl and then started to come down. This pattern happens again about 12:30 and at 2:00 pm. The most likely thing was that the person ate food and when they noticed they were going high gave too much insulin for the amount of food or carbs they ate. Giving too much insulin caused the glucose to fall fast and go very low. In this example, the glucose is 170 mg/dl and there are 2 trend arrows going down. This shows that the glucose is dropping fast. Learning how to adjust your food intake and insulin can take time. Carb counting can help too. Once you get the hang of understanding what your CGM is telling you, you can start making informed decisions on how to better manage your diabetes.



IS A CGM RIGHT FOR YOU?

The upside of using a CGM is...

- You can see your glucose level anytime without having to prick your finger.
- You can see patterns or trends in what your glucose does over a period of time. This information can help you adjust your insulin and reach your "time in range" and A1C targets.
- You can share your CGM reports with your diabetes care team. With this information, your diabetes team can:
  - Decide how much insulin you should take
  - Develop an exercise plan that is right for you
  - Suggest the number of meals and snacks you need each day
  - Correct the types and doses of medications you are taking
- You can share your glucose levels with a family member or friend.
- You can get alarms and alerts, so you know if your glucose levels are going too high or too low.
- Some sensors communicate with insulin pumps and direct them to deliver insulin.



There can be a downside of using a CGM...

- Sometimes people get upset at seeing their glucose levels all the time. This can be frustrating if you do not know what to do when you see a high or low number.
- Glucose levels are often higher for longer after meals than people realize. This can lead to giving insulin too soon after the meal. This is called "stacking". All of us like to feel successful. And it can sometimes feel like failure if glucose levels are too high or too low much of the time.
- The alarms and alerts can be going off often. This can wake you or your partner up from sleep. It can also be a bother when you are going out with other people or are at work.

About CGM alarms

It is important to work with someone on your diabetes team to help you understand what the CGM alarm is telling you and how to respond.

You can change the alarms on your CGM. Most CGM alarms can be changed from making a sound to just vibrating. You can also turn off many of the alarms.

What if I try the CGM and I do not like it?

Many people feel that their quality of life is better by using the CGM. They feel like they are more in control. But if you try it and do not like it, you can always go back to finger sticks to check your blood glucose.

THE CGM IN REAL LIFE

Can the CGM get wet?

In general, CGM sensors and transmitters are waterproof in up to 8 feet of water for at least 30 minutes. So you can swim, shower or take a bath. The receiver is not waterproof and will need to be put in a dry area. The CGM sensor will keep collecting information, but if your receiver is too far away, the information will not be transmitted. This means your receiver will not get glucose readings. There will be a gap and you may not be able to see what your glucose level was while you were in the water or too far away from your receiver. When in water, your receiver will need to be closer to you than when you are out of water. This is because the signal does not transmit as well in water.

Can I wear a CGM during sex?

The CGM sensor and transmitter are quite small and are rarely an issue during sex. The most common concern brought up by CGM users is that the alarms may start going off during sex becuase physical exertion can cause glucose levels to go up or down. Having an open talk with your partner about how diabetes may impact your sex life is important and can help fix any concerns you may have.

If I need a medical test like an X-ray, a CT Scan or an MRI, should I remove the CGM?

Sometimes yes and sometimes no. Ask your doctor or the person doing the test if you can leave your CGM on or not.

PAYING FOR A CGM

Will my medical insurance cover the CGM?

Not all insurance compaines (sometimes called health plans) cover the cost of the CGM. Ask someone from your diabetes team if your health plan will pay for your CGM. They might know because they have prescribed CGMs before.

You can call your health plan to find out which CGMs they cover. If the CGM you are hoping for is not covered, it is ok to ask for what you want. Sometimes you can get them to cover the CGM you are asking for if you have good reasons for needing that specific type.

Another way to find out is to contact the CGM company. These companies want to sell you a CGM. So, if you give them your name and health plan information they will find out if your insurance will cover the CGM.

Many health plans pay most of the cost of a CGM. But not all the costs. If your plan does cover the CGM, then also find out how much money you would have to pay.

Are there other costs related to the CGM?

Other costs depend on the system you choose.

- You may need more sensors.
- You may need more transmitters.
- You may want a receiver. Many CGM systems come with their own receiver.
- You may use a smartphone. This cost will not be covered by insurance.
- There are supplies you will have to purchase not covered by insurance such as:
  - Tape to help keep the sensor and transmitter in place
  - Carry cases to hold receivers

Most often, your doctor will need to fill out forms and send them to your insurance company. Your insurance company will use these forms to decide what CGM system is covered and how much you need to pay. You will need to see your diabetes team on a regular basis to complete new forms, so you can keep getting your sensors and transmitters.

What would a CGM system cost if I had to pay for it myself?

If you do not have health insurance, CGM systems cost between $500 and $1,500 to get started. Monthly supplies, including sensors, cost about $75.00 to $500. This does not include smartphone costs.

Is there any way to get a discount if I pay for the CGM myself?

Some CGM companies may offer a discount if you are paying for it yourself. You can talk to your diabetes team or ask the CGM company if they offer any discounts.

What is the basic process for getting a sensor through insurance?

1. Some sensors are a **pharmacy benefit**. This means your doctor has to order the CGM system at a pharmacy. This is the easiest way to do it. These sensors are often the Libre and Dexcom.
2. If a CGM is **not a pharmacy benefit** through your insurance, then it is covered under Durable Medical Equipment (DME). This works in a different way. Your diabetes care team fills out a form called a Certificate of Medical Necessity (CMN). This is sent to the company that makes the CGM device or thier distributor. They may send your diabetes care team another form to fill out. This will also include sending notes from your chart. You will need to know who your distributor is because they are the people who will ship you your CGM. Also, they are the people you will need to get to send out the forms so your doctor can help you. Sometimes your health plan will give you a choice of distributors. It is often a good idea to call around to see who charges the least.