

The Hormone Foundation's Patient Guide to Continuous Glucose Monitoring

Continuous glucose monitoring, also called CGM, is a new way for people with diabetes to check their glucose (sugar) levels. CGM automatically measures glucose levels every few minutes around the clock. Most people who use CGM have type 1 diabetes and use insulin to manage their condition.

The most common way to self-check blood glucose levels is to prick the skin to get a drop of blood, put the blood on a test strip, and insert it in a glucose meter. CGM, though, measures glucose in the interstitial fluid—the fluid between body cells just under the skin.

People with both type 1 and type 2 diabetes use the results of blood glucose tests to make decisions about food, medicines, and exercise. Keeping blood glucose levels as close to normal as possible can prevent or slow many long-term complications of diabetes. It also can prevent immediate problems that can result from glucose levels that are too high (*hyperglycemia*) or too low (*hypoglycemia*).

CGM has some advantages over blood glucose meter tests, but it also has drawbacks. CGM systems are not right for every patient with diabetes. This guide is based on The Endocrine Society's practice guidelines for physicians about which diabetic patients should use CGM to try to achieve better glucose control.

How does CGM work?

There are two types of CGM devices. Short-term CGM is used for a few days at a time to help a diabetes care provider monitor glucose levels in type 1 or type 2 diabetes patients and make any needed corrections to the patient's treatment plan. The other type, called "real-time" CGM (or RT-CGM), is used long-term and helps people with type 1 diabetes manage their diabetes day-to-day. Like short-term CGM, RT-CGM provides useful information for the health care team as well.

CGM devices have three main parts: sensor, transmitter, and monitor (also called a receiver).

A tiny sensor is inserted under the skin through a small needle. There, it measures glucose in the fluid between the cells. The sensor is disposable. You will need to replace it every 5 to 7 days depending on the model.

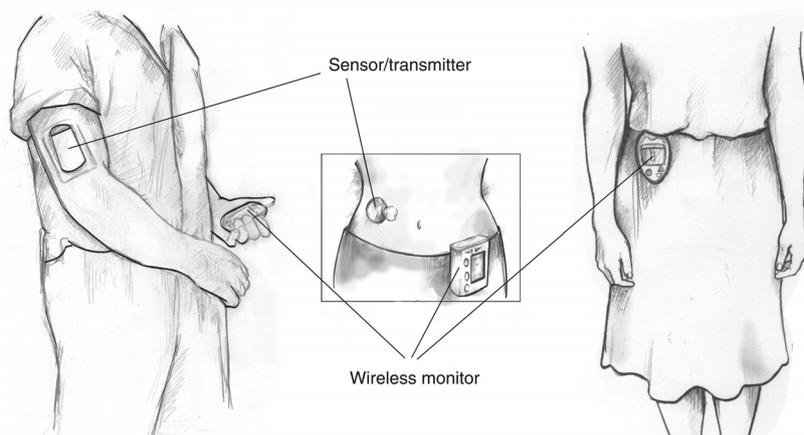
The transmitter is a small device that attaches to the sensor and sits on top of your skin above the sensor. The transmitter uses radio waves to send information about glucose levels to a wireless monitor.

The RT-CGM monitor shows information about glucose levels on a screen. You can wear the monitor, which is the size of a cell phone, on a belt or pants waistline or keep it in your pocket. The monitor includes an alarm that warns of glucose levels that are above or below your personal target levels. Some models display

information on an insulin pump.

To make RT-CGM readings more accurate, you enter the results of blood glucose meter tests into the monitor about twice a day. Adjusting the monitor reading to match your blood glucose level is called *calibration*.

Both types of CGM systems give reports to you and your diabetes care team about glucose levels. For instance, one report graphs average glucose levels for a few hours or for



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24 hours. CGM systems also allow users to record when they ate meals or took medicines, which can help them understand the trends in their glucose levels.



Share reports from your CGM system with your health care team to guide any changes to your diabetes management plan.

How does CGM compare with standard blood glucose tests?

Studies show that both short- and long-term CGM systems may help patients with diabetes achieve better glucose control than standard blood glucose monitoring. If you have type 1 diabetes and use RT-CGM nearly every day, it is possible to lower your A1c levels (average blood sugar levels over the past two or three months) to less than 7%, if needed, and to maintain these target levels. Other pluses of RT-CGM:

- Avoids the need for multiple blood samples throughout the day
- Automatically checks glucose levels every 1 to 5 minutes, even while you are asleep
- Shows ups and downs of glucose levels around the clock, rather than just at certain points in time
- Sounds an alarm when glucose levels are too low or too high

However, RT-CGM has some drawbacks:

- Costs more than blood glucose meter testing
- May not be covered by health insurance
- Is not as accurate as standard blood glucose meters

Who should use CGM?

The Endocrine Society's expert panel believes that the benefits of RT-CGM may be worth the costs for many patients with type 1 diabetes. The experts recommend that the routine use of RT-CGM be considered for people with diabetes who:

- Are not in the hospital, *and*
- Are ages 8 years or older, *and*
- Have A1c levels less than 7% (tight glucose control), *or*
- Have A1c levels of 7% or higher if they show they can use a CGM device almost every day.

When used nearly each day, RT-CGM can help children, teens, and adults maintain or reach target A1c levels while limiting the risk of low blood sugar.

There is not yet enough research proof to recommend for or against CGM use in children with type 1 diabetes who are less than 8 years old. Your child's health care provider can decide if your young child should try CGM.

Sometimes the standard blood glucose meter tests miss large and long-lasting ups and downs in blood sugar levels. Therefore, the expert panel also suggests the short-term use of CGM as needed to monitor glucose levels in patients with type 1 or type 2 diabetes who use insulin and who:

- Have low blood sugar at night
- Have high blood sugar in the early morning or after eating
- Have no symptoms of low blood sugar until they faint (*hypoglycemic unawareness*)
- Are changing their diabetes treatment, such as starting a new insulin or switching to an insulin pump
- Have a long-lasting rise in A1c for reasons that are unclear

Who should not use CGM?

Patients with diabetes in a hospital intensive care unit (ICU) or operating room should not have glucose monitoring only with CGM. These patients may be unconscious, sedated, or asleep. They likely cannot give feedback about symptoms of low blood sugar. There is not enough research showing whether CGM is accurate and safe in these patients.

What can you do to help your treatment process?

If you are interested in RT-CGM, talk to your doctor about whether it is right for you. Once you get a RT-CGM device, make sure you receive training in how to properly use it. Then use the information about glucose trends from your RT-CGM device to take steps to keep your blood glucose levels in a safe range. You should still confirm RT-CGM results with a blood glucose meter test before adjusting your insulin dose or taking other action to correct high or low glucose levels.

Share reports from your RT-CGM system with your health care team to guide any changes to your diabetes management plan. It is still important to follow the advice of your diabetes care provider on how to achieve and maintain good glucose control.

If you used an RT-CGM device in the past and found it uncomfortable or too hard to use, you may want to ask your doctor about new CGM systems. Newer CGM devices are easier to use, more comfortable, and more accurate.

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