

Maryland Endocrine PA

GETTING THE MOST OUT OF CONTINUOUS GLUCOSE MONITORING (CGM)

A CGM Allows you to get an estimate of your current blood sugar every 1 to 5 minutes. An important difference between it and a fingerstick is that a CGM tells you what direction your blood sugar is heading, and how fast it is changing. That information can allow you to do something about rapidly falling blood sugar before it is a problem, and to learn to modify the way you eat and take your insulin or other diabetes treatments to lower the post meal blood sugars. It also lets you see the effect of different foods, different activities, and stress on your blood sugar as it is happening. That can help you and your doctor adjust your diabetes medication, diet and the rest of your routine to reduce the amount of low blood sugar and high blood sugar you experience.

There are 2 basic types of CGM available in the US: real time CGM and intermittently scanned CGM. Real time CGM's (Minimed, Dexcom, Eversense, and Libre 3 plus) are **active**: they will actively update all the time without the need to scan. The libre 2 plus is an intermittent CGM and requires scanning to update. Only the records for the last 8 hours every scan, so it is important to scan frequently when using the libre 2 plus.

- **Understanding Accuracy:**

- Some CGM's are calibrated against fingerstick (Sensionics Eversense, and some Minimed CGM's). Libre is factory calibrated and cannot be calibrated. Dexcom G6, G7, and G7 15 day are factory calibrated but can be calibrated if they are off. Fingerstick only gives you an estimate of what blood sugar is. Think of the reading on a fingerstick that was done properly on an accurate meter as plus or minus 15% - not 15 points, 15 percent. For example, at 200 mg/dL, that would be plus or minus 30 points, or anywhere between 170-230 mg/dL. Some meters are more accurate than others, and some perform quite poorly. You can see an evaluation and report on the meter accuracy of

18 different common meters by going to this site:

www.diabetestechology.org/surveillance.shtml or google the term “Diabetes Technology Society Meter Surveillance”.

- The meter and CGM are not usually going to give the same number. They are both estimates. A reasonable expectation is that the CGM and meter readings should be within 20% of each other most of the time.
- Don't take Tylenol (Acetaminophen, abbreviated as APAP) when using a Minimed CGM because it looks like sugar to the sensor. That is, the CGM can read falsely high. If you do take APAP, the sensor might run higher for 3-4 hours, depending on the dose you took and the type of CGM. **Dexcom G6, Eversense, and Freestlye Libre do not have any interference from Tylenol.**
- **Vitamin C** interferes with accuracy of **Libre** and can be read as a false high. Don't take high doses (500mg or more) of Vitamin C if using Libre.
- No CGM is perfect. If the CGM reading does not make sense to you or is different than your symptoms, you should always verify with a fingerstick before acting.
- **Calibration is Key (Does not apply to Dexcom G6, G7 or Libre):**
 - It is vital that you use high quality fingerstick to calibrate your CGM. Your finger must be clean and dry, you need to have enough blood, the strips must not be expired and have been stored capped and not exposed to extreme temperatures, such as can occur in a car in the summer. Food or juice on your fingers could throw the fingerstick off by as much as 100-200 mg/dL in some cases. Any creams or moisturizers can cause a false high reading.
 - It is best to not calibrate at a time when the blood glucose is changing rapidly.
 - Minimed CGM is more accurate when you calibrate 3-4 times a day.
 - It is also not a good idea to calibrate when you are recovering from a low blood sugar reaction- meaning you had a low, treated it with juice, sugar or

glucose tablets, and are wondering if you are still low. The CGM may be 10-15 minutes behind the real blood sugar in that situation, and the things we do to quickly fix the low blood sugar tend to make it rise rapidly.

- **Alarms should mean something:**

- Be careful in setting the high and low alarm levels and any repeat times, especially when you first start using a CGM. If you get so many alarms that you ignore them, it defeats the whole purpose of an alarm. Repeating time for a high blood sugar should not be less than 2 hours and is best set at 2-3 hours for most people. For a low alarm, repeat times should not be less than 30 minutes, to allow the sensor to 'catch up' to the fingerstick.
- Don't ignore low alarms, especially at night. Almost all severe low reactions that occur when a person is on a CGM occur when the person did not act on a low blood sugar alert or alarm. Don't delay treatment- low blood sugars can be dangerous!

- **Be Patient:**

- If you take extra insulin to lower a high blood sugar, give it at least 2 hours to see some effect before you consider re-treating with more insulin. Only $\frac{3}{4}$ of the effect on blood sugar would be seen within 3 hours, and it can have an effect for up to 5-6 hours with rapid insulins (Humalog, Admelog, Lyumjev, Novolog, Fiasp, Apidra). For example, if the blood sugar has not gone down in 1 hour and you take more insulin, you will likely get what is called **stacking**- multiple doses of insulin that overlap or stack up on top of each other, which can drop your blood sugar too low.
- If you are low, don't use the CGM to guide how much you eat or drink. That is don't keep eating until you feel better, or the CGM says you are no longer low, because it will cause you to overshoot and get a rebound of high blood sugar. It usually takes 15 minutes for your blood sugar to go up with rapid sugar, and the CGM lags 10 minutes behind. Take about 15 grams of sugar (4 glucose tablets, 4-6 ounces of fruit juice or soda, 3-4 life savers, or 3-4

starburst candies) and wait 15 minutes. If you think you are still low, check another fingerstick- but wash your hands first!

- **Look for patterns and try to improve your control:**

- Look for foods that really raise the post meal blood sugar. To reduce the post meal blood sugar rise, you may need to increase the amount of insulin you take for those foods. Don't forget that there is another way to eat less carbohydrates or eat carbohydrates that does not increase blood sugar as fast. Rice, white bread, corn chips, pretzels, mashed potatoes, and most breakfast cereals are foods with rapid spikes. Sweet potato, most vegetables, whole grain bread, and pasta tend to have slower spikes.
- **Pre-bolus:** You can get better post meal control with the same dose of insulin by giving a bolus/shot 15-20 minutes ahead of the meal (but don't wait an hour- that would be too long!). Don't do this if the blood sugar is low to start with, or if you need to drive before eating.
- **Fiasp** (Fast insulin aspart, a faster form of Novolog) or **Lyumjev** (Fast Humalog) start working twice as fast in the first hour and can help lower post-meal spikes without having to pre-bolus.
- **Afrezza**, the only inhaled insulin, is much faster than any injected insulin and can lower post meal spikes very effectively. Check with your doctor to see if you think this might be right for you.
- High fat foods like pizza, fried foods, and cheese can also raise the blood sugar, and the increase often persists, and it can stay up to 4-8 hours. You probably need more insulin than just needed to cover the carbs and might need a delayed bolus if on a pump or a later smaller shot 1-2 hours later.
- One approach that works for a lot of people on insulin pumps for high fat foods like pizza is to give 30-50% more insulin than needed for carbohydrates but give the extra insulin over 2 hours if on a pump that can square wave or as another bolus 1-2 hours after the meal. If on an injection, a second smaller injection 1-2 hours after the meal can be helpful.

- Eating carbohydrates at the end of the meal will reduce the post meal blood sugar increase.
- **CGM can't help you as much if you don't use it regularly:**
 - If you tried one system and did not like it, try a different system.
 - Try to use the system every day. If you use Libre 2 plus, scan it at least every 8 hours. Most people find CGM really helps them get better blood sugar control and reduce the risk of low blood sugars.
- **Share:** Lets someone else get your blood sugars in real time if available with your CGM.
- **CGM** is a powerful tool to help you get better control of your blood sugar, **not a cure for diabetes.**

If you have **severe low blood sugars at night**, or **do not hear your alarms at night**, or **have a lot of blood sugar fluctuations at night**, a hybrid closed loop insulin pump can help. Talk to your doctor about using a Minimed 780G, Omnipod 5, T: Slim X2, Mobi, Twiist, or I-let insulin pump, which can continuously adjust insulin based on the CGM.

Glossary

CGM - A continuous glucose monitoring device. Typically worn on the skin using an adhesive patch integrated with the device. The device connects with a receiver or a smart phone application to actively monitor your blood sugar. Poling rates of the device can vary and may update only every five minutes in the app, but these readings are ten to fifteen minutes behind the current blood glucose. Some devices must be manually scanned to give a reading.

Fingerstick – An instance of pricking the skin of a finger to obtain blood from a capillary.

Glucose Monitor - A medical device is used to measure and track blood sugar (blood glucose) levels. This may be referred to as a blood glucose meter, or glucometer. Traditional monitors require a small sample of blood usually obtained by pricking a fingertip with a lancet.

Insulin Pump - A relatively small wearable device that delivers insulin continuously or when commanded to help manage diabetes. An insulin pump is computerized and designed to mimic the natural function of a pancreas. Insulin pumps use cannulas for insulin delivery which is inserted subcutaneously. Insulin pumps have an internal or removable reservoir to store insulin for the effective life of the reservoir.

Closed Loop Insulin Pump - Insulin pumps that integrate with a CGM for automated insulin delivery. While the delivery is automated, users should still inform the insulin pump about meals and exercise.

Open Loop Insulin Pump - Insulin pumps that require the user to calculate and administer insulin doses for meals, corrections or basal needs.

Rapid Acting Insulin – Also referred to as short acting insulin, is a type of insulin that begins to work within 10-30 minutes after injection. It typically lasts for two to four hours.

Insulin Stacking – Happens when a person with diabetes injects rapid-acting (bolus) insulin multiple times before the previous dose has fully taken effect. Rapid-acting insulin typically begins working within 10-30 minutes and peaks around 1-2 hours. If another dose is given too soon, the insulin from the first injection is still active, and the combined effect can lower blood glucose excessively resulting in hypoglycemia

Hypoglycemia - Hypoglycemia means your blood sugar is below 70 milligrams per deciliter (mg/dL). This measurement is monitored by either fingerstick tests or a CGM.

Severe Hypoglycemia - Sometimes referred to as insulin reaction or insulin shock, severe hypoglycemia is when blood glucose (blood sugar) drops dangerously low. This can still occur in people who do not use insulin. You may become confused, lose consciousness (pass out), or treatments for low blood sugar may be less effective. It is often defined by blood glucose less than 54 mg/dL.

Hyperglycemia – A term used for high blood glucose levels, typically occurring when the body has insufficient insulin or cannot use insulin effectively. This can result in increased thirst, frequent urination, fatigue, blurred vision, or headaches.

Carbohydrates - Any of a large group of organic compounds that include sugars, starch, and cellulose, containing hydrogen and oxygen in the same ratio as water (2:1) and used as structural materials and for energy storage within living tissues. They are micronutrients in food that provide energy by breaking down into glucose.

APAP – An abbreviation for Acetaminophen, commonly known under the brand name Tylenol.