



## CONTINUOUS GLUCOSE MONITORING

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### What is continuous glucose monitoring (CGM)?

- Measuring of the body's sugar (glucose) levels in the tissue fluid through wearable technology

### What does CGM measure?

- Blood sugar levels are measured every 5-15 minutes depending on the device

### Why do blood sugar levels need to be monitored?

- Determine the correct dose of insulin to administer
- Low blood sugar, or hypoglycemia, can make you feel anxious, sweaty, and dizzy. Untreated hypoglycemia can result in seizures, coma, or even death.
- High blood sugar, or hyperglycemia, can cause increased urination, increased hunger, and increased thirst. Other symptoms may include nausea, vomiting, dry mouth, weakness, and confusion.
- Food, exercise, and illness all can affect blood glucose levels.

### Why does controlling blood sugar matter?

- Long term uncontrolled blood sugar levels can result in serious complications such as:
  - Eye or vision damage
  - Nerve damage, often resulting in numbness, weakness, or tingling
  - Kidney damage
  - Heart Disease
  - Stroke

### What are the recommended blood sugar ranges?

- Blood sugar goals are individualized based on different factors that your doctor will consider.
- According to the American Diabetes Association (ADA) the following ranges are appropriate for most nonpregnant adults.
  - HbA1C: <7%
  - Before meal plasma glucose: 80-130 mg/dL
  - After meal plasma glucose: <180 mg/dL

### How does CGM work?

- A CGM device consists of a sensor, transmitter, and receiver.
  - Sensor: inserted under the skin with an applicator and monitors the plasma sugar levels
  - Transmitter: applied on top of the sensor and sends the data to the receiver
  - Receiver: displays the data; often a smart phone app or handheld device

- There are two general types of CGM's:
  - Real time CGM (rtCGM)
    - Measure and transmit glucose values every 5 minutes and automatically sends the data to the receiver
  - Intermittently scanned CGM (isCGM)
    - Measure glucose every minute but record measurements every 15 minutes
    - To view glucose readings and trends, you must swipe the reader over the sensor and transmitter

#### **What are the benefits of CGM over traditional blood glucose testing?**

- Better control of your overall blood sugar
- Reduced number of fingersticks
- Visualize blood sugar trends
- Blood sugar tracking at night while you sleep
- Reduced risk of severely low blood sugar
- Easier access to more information for your doctors






#### **Are fingersticks eliminated with CGM?**

- Occasional fingerstick are recommended when the CGM reports severely high or low blood sugars, during warm up times, and calibration for some devices.

#### **Who would benefit from CGM?**

If you fall into one of the categories below, you may want to discuss with your doctor the benefits of CGM.

- Using insulin pumps or multiple daily doses of insulin
- Data sharing desired
  - Children requiring continuous adult support
  - Elderly with T1DM
  - Patients with T1DM who travel alone
- Fear of severely low blood sugar
- Desire insulin pump integration
- Athletes or physically active
- Newly diagnosed T2DM for episodic use
- Desire alternative to traditional blood sugar testing
- Physical limitations that prevent traditional blood sugar testing
- \*This is not an all-encompassing list. Your individual goals, lifestyle, and preference should be discussed with your doctor to determine potential benefits.

	Freestyle Libre	Freestyle Libre 2*	Dexcom G6	Guardian Sensor 3	Eversence
<b>Company</b>	Abbot	Abbot	Dexcom	Medtronic	Ascensia
<b>Approved Age (yrs)</b>	18+	4+	2+	14+	18+
<b>Reading Frequency (min)</b>	15	15	5	5	5
<b>Transmission</b>	Scan required	Scan required	Automatic	Automatic	Automatic
<b>Fingerstick Calibration</b>	Not required	Not required	Not required	2/day minimum	2/day minimum
<b>Predictive Values</b>	No	No	Up to 20 minutes	Up to 60 minutes	Up to 30 minutes
<b>Transmitter Size</b>	2 stacked quarters	2 stacked quarters	Pink eraser sized	2 stacked quarters	Watch face
<b>Sensor Warm Up Time (hrs)</b>	1	1	2	2	24
<b>Sensor Wear Time (days)</b>	14	14	10	7	90†
<b>Transmitter Design</b>	Disposable; integrated in sensor patch	Disposable; integrated in sensor patch	90 day use, separate from sensor	Rechargeable, separate from sensor	Rechargeable, separate from sensor
<b>Approved Site</b>	Back of the upper arm	Back of the upper arm	Abdomen	Abdomen or back of the upper arm	Implanted in upper arm
<b>Alarms for lows/highs</b>	None	Customizable	Customizable Can alert trends	Customizable Can alert trends	Customizable/ vibrating alarms Can alert trends
<b>Apps</b>	FreeStyle LibreLink 	FreeStyle Libre 2 	Dexcom G6 	Guardian ConnectUS 	Eversense 
<b>Cost‡</b>	Sensor + transmitter \$140	Sensor + transmitter \$147	Transmitter \$255 Sensors \$381	Transmitter \$620 Sensors \$345	Transmitter >\$1000 Sensor insertion/removal: \$200-400
<b>Medicare?</b>	Yes	Yes	Yes	Only if used in combination with insulin pump	Yes
<b>Insulin Pump Integration?</b>	No	No	Yes	Yes	No
<b>Sharing Capabilities?</b>	Yes with LibreLinkUp app	Yes with LibreLinkUp app	Yes with apps: HCP: Dexcom Clarity Family/Friends: Dexcom Follow	Can upload app data to CareLink website, but no apps for followers	Yes with Eversense NOW US app

### AVAILABLE CGM DEVICES

\*In May 2022, the FDA approved Freestyle Libre 3 system which is a smaller version of Freestyle Libre 2 that does not require scanning for reading transmission.

† In February 2022, the FDA approved Eversence E3 which consists of a sensor that can last up to 180 days.

‡ Estimated costs of a 30 day supply obtained from GoodRx



**Freestyle Libre**

This photo shows the sensor/transmitter patch, iPhone app screen, and handheld receiver.



**Freestyle Libre2**

This photo shows the sensor/transmitter patch, iPhone app screen, and handheld receiver.



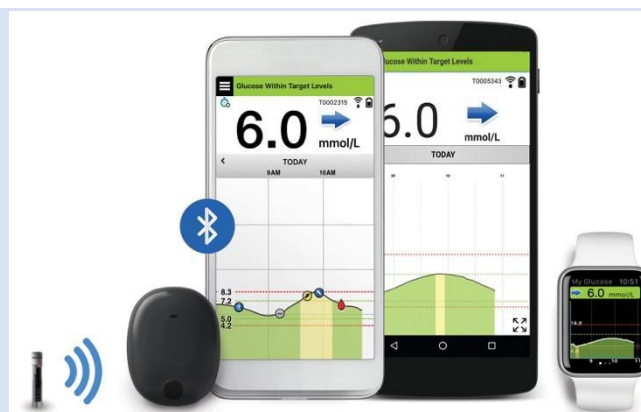
**Dexcom G6**

This photo shows the sensor applicator, grey transmitter, handheld receiver, and the iPhone and Apple Watch screens that correspond with the app.



**Guardian Sensor 3**

This photo shows the guardian transmitter, handheld receiver, and iPhone screen.



**Eversense**

This photo shows the small sensor that is inserted into your arm. It also shows the black transmitter and the iPhone and Apple Watch screens. The handheld receiver is also shown.

**Resources:**

1. "Continuous Glucose Monitoring". Cleveland Clinic. July 2021. [cited July 16, 2022]. Available from <https://my.clevelandclinic.org/health/drugs/11444-glucose-continuous-glucose-monitoring>
2. Weinstock, Ruth S. "Glucose monitoring in the management of nonpregnant adults with diabetes mellitus". UpToDate [Internet]. Waltham, Mass. Last reviewed June 2021. [cited July 16, 2022]. Available from <https://www.uptodate.com/contents/glucose-monitoring-in-the-management-of-nonpregnant-adults-with-diabetes-mellitus?search=continuous%20glucose%20monitoring&anchor=H3&language=en-US&source=preview#H3>
3. American Diabetes Association. "The Big Picture: Checking your Blood Glucose". [cited July 16, 2022]. Available from <https://www.diabetes.org/healthy-living/medication-treatments/blood-glucose-testing-and-control/checking-your-blood-sugar>
4. American Diabetes Association. 7. Diabetes Technology: Standards of Medical Care in Diabetes-2021. *Diabetes Care*. 2021;44(Suppl 1):S85-S99. doi:10.2337/dc21-S007. Available from <https://pubmed.ncbi.nlm.nih.gov/33298418/>

**Manufacturer Websites**

1. Freestyle Libre. Abbot. [cited July 16, 2022]. Available from <https://www.freestyle.abbott/us-en/home.html>
2. "Dexcom G6 Features and Benefits". Dexcom. [cited July 16, 2022] Available from <https://www.dexcom.com/g6/features-and-benefits>
3. "Guardian Connect System". Medtronic. [cited July 16 2022]. Available from <https://www.medtronicdiabetes.com/products/guardian-connect-continuous-glucose-monitoring-system>
4. "Eversense CGM system". Eversense. Ascensia Diabetes Care Holdings. Senseonics, Inc. [cited July 16, 2022]. Available from <https://www.ascensiadiabetes.com/eversense/eversense-cgm-system/transmitter/>