



PONDERING PUMPS & SENSORS

CHILDRENS MERCY DIABETES TEAM

DISCLOSURES

01 **Dexcom**

02 FreeStyle *Libre* 

03 **Medtronic**

04 

05  **TANDEM**
Diabetes Care

06 **Beta Bionics**

TYPES OF DIABETES TECHNOLOGY

Continuous Glucose Monitor (CGM) This is a wearable device that reads your glucose levels in the interstitial fluid (under your skin) every 5 minutes.

- Shows arrows that predicts if your glucose is trending up, down or going steady
- Can be used when giving multiple daily injections or with an insulin pump

Insulin Pump

This is a small portable device that delivers insulin continuously under your skin (subcutaneously).

Medtronic Inpen

This is a reusable "smart" insulin pen that connects to a smartphone app via Bluetooth.

- Automatically logs insulin doses, helps calculate insulin doses, connects to a CGM and give reminders for doses

Let's review each one in detail!

CONTINUOUS GLUCOSE MONITOR (CGM)

These monitors are attached to your body and give you glucose readings



HOW DOES A CGM WORK?

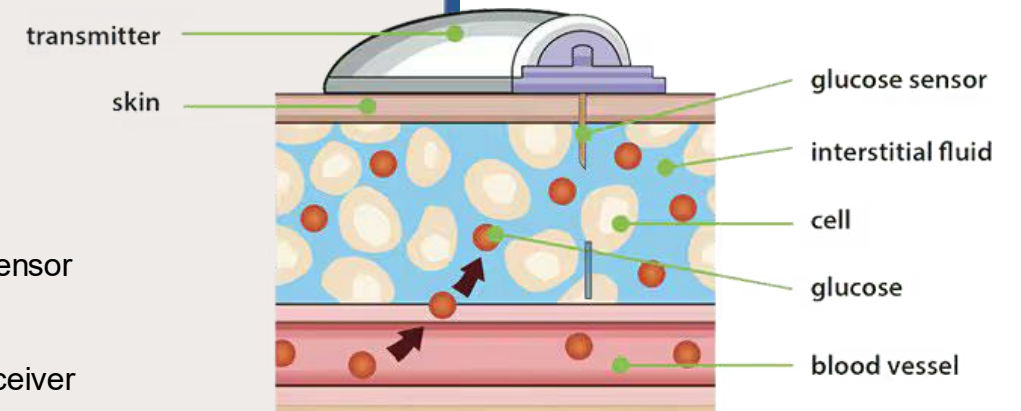
CMG's contains 3 parts:

- **Sensor** - thin filament under the skin
- **Transmitter** - battery device that sends glucose data via Bluetooth
- **Receiver** - device that shows your glucose data

During the application process, a small sensor is inserted under your skin. The sensor reads the glucose level in the interstitial fluid (fluid under your skin).

The sensor is connected to a transmitter that sends the glucose readings to a receiver (like a smartphone, insulin pump or another device).

The receiver shows your glucose numbers continuously. The receiver also shows arrows, which can tell you where your glucose is heading soon. Alerts are given for high and low glucose readings.

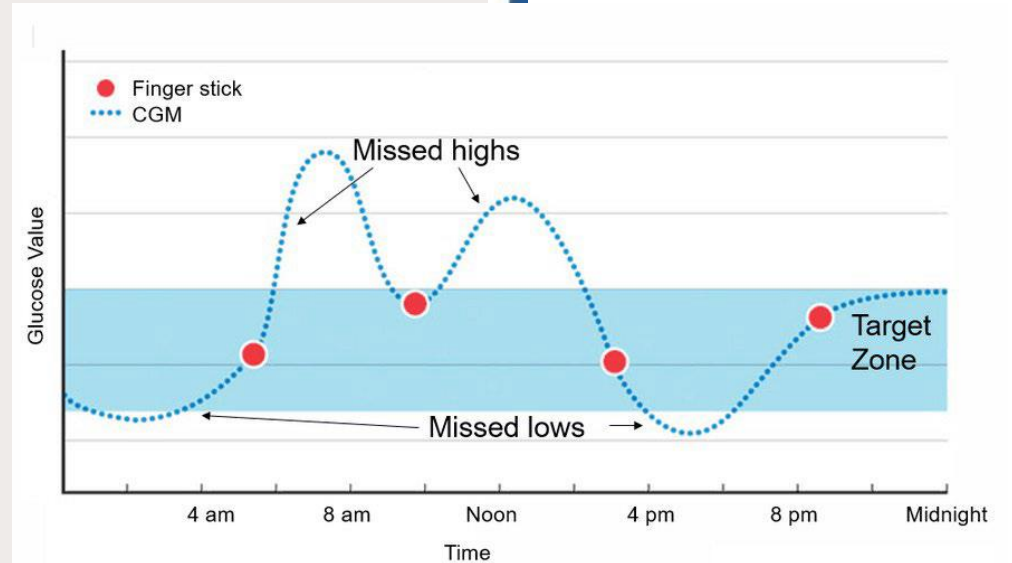


CGM VS. FINGERSTICKS

CGMs provide continuous data that helps people with diabetes understand their glucose trends, patterns, and how different factors (like food, exercise, and stress) affect their blood sugar levels. When you do a finger stick, you can only see blood sugars at one point in time.

It is important to remember that short-acting insulin continues to work in the body for 3 hours.

- If glucose appears high 20 minutes after you have dosed for food does not mean you need to give more insulin.
- Wait to see how your blood sugar looks after 3-hours.



CGM VS. FINGERSTICKS

Remember...

A CGM measures glucose in the interstitial fluid. A finger stick measures glucose from capillary blood. It is expected that these numbers may be as much as 30-40 points off when comparing the numbers. Always check a finger stick if you think your CMG reading is not accurate.

The CGM may read LOW when the blood sugar is not actually low if

- you are dehydrated (less interstitial fluid)
- If the sensor is being compressed (sleeping or sitting on the sensor).

While technology is a wonderful and helpful tool, it can fail. It is your responsibility to remember to check blood sugars with a glucometer if your CGM stops working. Always keep your test strips and glucometer around for back up testing!

DEXCOM G7

10 day or 15 day wear (18+)

Two-part system:

1. sensor/transmitter
2. Receiver, Mobile app or pump



Features:

- 30- minute warm-up period
- No finger sticks required*
- Updates data every 5minutes
- Alarms for lows or highs
- Use a receiver or compatible phone to see blood sugar.
- *If using a mobile app*, data can share with followers such as parents, school nurses, etc

FDA approved for 2 years and older

Compatible pumps:

- iLet
- Tandem Tslim x2
- Tandem Mobi
- Omnipod 5



DEXCOM REPS:

Shelley

Mobile: 816-507-0927

Email: shelley.otto@dexcom.com

Mindy

Mobile: 816-668-0698

Email: mindy.pugliese@dexcom.com

Website for more information:



FREESTYLE LIBRE 2 PLUS

Two-part system:

- Sensor-transmitter
- Reader/Mobile app or Pump

Features:

- 1 hour warm - up period
- Size of a quarter
- No finger sticks required
- Has alarms for highs and lows
- 15-day wear
- Use a reader, compatible phone or insulin pump to see blood sugar.
- FDA approved for 2 years of age and older

Compatible pumps:

- Omnipod 5
- Tandem T slim x2



FREESYLE LIBRE 3 PLUS

Two-part system:

- sensor-transmitter
- Mobile app or Pump

Features:

- 1 hour warm-up period
- Size of a penny
- No scanning required, updates glucose every minute
- No finger sticks required*
- Has alarms for highs and lows
- 14-day wear
- If using a mobile app, data may be shared with up to 20 followers such as parents, school nurse, etc.
- FDA approved for 4 years of age and older

Compatible pumps

- Tandem Tslim X2
- iLet
- Twiist



MEDTRONIC GUARDIAN 4

3-part system:

- sensor
- transmitter
- Receiver or pump

Features:

- 2-hour warm-up period
- Fingerstick calibrations required every 12 hours
- Has alarms for highs and lows
- 7-day wear
- Data may be shared with up to 5 followers such as parents, school nurses, etc.
- FDA approved for 7+ years of age and older

Compatible Pump

- Medtronic MiniMed 780G

[Video Tutorial](#)



MEDTRONIC INSTINCT

2-part system:

- Sensor/transmitter
- Pump

Features:

- 1-hour warm-up period
- No calibrations required
- Has alarms for highs and lows
- 15-day wear
- Data may be shared with up to 20 followers such as parents, school nurses, etc.
- FDA approved for 7+ years of age and older

Compatible Pump

- Medtronic MiniMed 780G



MEDTRONIC INPEN

If you are interested in the pump technology but you are not interested in wearing a pump

- The Inpen allows you to continue giving shots but with many of the advancements of a pump.

This reusable pen is connected to an app on your smart phone which includes:

- Bolus calculator
- Half-unit dosing
- Dose reminders
- Carb counting support
- Digital logbook



You will switch out the insulin cartridge to fill the pen

It is reusable for 1 year

[Website for more information](#)

INSULIN PUMPS



INSULIN PUMP BASICS

Insulin pumps are an alternative to multiple daily injections.

The insulin pump is filled with short-acting insulin and will provide a continuous infusion of insulin 24 hours a day.

- This means you will **no longer be administering your basal insulin.**

You must remain attached to the insulin pump at all times. Even when sleeping.

Possible exceptions:

- Taking a shower or bath
- Swimming
- Sports

Pump sites can be placed anywhere you would give an insulin injection. You still need to rotate these sites as you would injections

INSULIN PUMP BASICS

An Insulin pump works by providing insulin in two ways. Just like the 2 different insulin injections:

- Basal
 - Small amount of insulin every hour. This will replace your long- acting insulin injection.
- Bolus
 - When you enter the number of carbs into your pump, it will calculate exactly how much insulin to give for your food as well as for corrections when needed.
 - Will calculate precise doses of insulin needed by entering blood sugar and/or grams of carbohydrates.
 - Insulin delivery without fear of insulin stacking.
 - Accurate dosages delivered without extra injections.

You still need to input the carbs and tell it to give corrections.

- The closed-loop system pump allows the system to increase and decrease background insulin as needed.
- **You cannot set it and forget it.**

INSULIN PUMP & DKA

Technology is a wonderful tool, but it can fail us. It is very important that you understand what steps to take if this happens.

- If insulin delivery stops, high blood sugars can develop very quickly. This can be caused by:
 - tubing kinks
 - battery failure (forgetting to charge the pump)
 - empty reservoir (run out of insulin)
 - bad pump sites
- It is important to check ketones as soon as you notice a high blood sugar (above 240).
 - If moderate or large ketones exist:
 - You must give a correction via insulin pen and change your pump site.
 - If negative, trace or small ketones exist:
 - You may give a correction through the pump.
- If the pump cannot be replaced within 1- 2 hours:
 - you need to give an injection of their long- acting (or basal) insulin.

Insulin Pump Brands

Just like CGM's, you have many choices when it comes to insulin pumps. The following information will review pumps, their **features and their algorithms**.

It is important to review all the elements of a pump. Do not choose a pump by the way it looks.

MO Healthnet will only replace tubed pumps every 5 years.
Will not approve an Omnipod if a tubed pump has been purchased in the last 2 years.



TANDEM TSLIM X2

Touch screen pump able to be controlled from the pump or from compatible mobile app.

Compatible CGM's:

- Dexcom G7 10 day wear or 15 day wear
- Libre 3+
- Minimum fill: 110 units and holds up to 300 units.
- Minimum total daily dose: 5 units
- Not waterproof
- Must be charged via USB

Algorithm: **Control IQ+**

- Automated system will communicate with the CGM to adjust every 5 minutes
- Pump will give auto bolus doses when blood sugar is above target range.
- Pump will adjust basal rates automatically based on CGM data.
- Pump can be placed in "sleep mode" which will prevent corrections while sleeping and only adjust basal rates.
- Pump can be placed in "exercise mode." This will prevent corrections and increase target to prevent hypoglycemia

FDA approved for 2 years and older
Source: Tandemdiabetes.com



TANDEM MOBI

Full control of pump via iPhone and compatible Android phones

Device does not have to have data-just Bluetooth capabilities.

Compatible CGMS:

- Dexcom G7 10 day & 15 day wear
- Minimum fill: 30 units and holds up to 200 units.
- Watertight: 8 ft up to 2 hours
- "Find My Pump" feature available.
- Minimum total daily dose: 5 units

FDA approved for 2 years and older
Source: Tandemdiabetes.com

Algorithm: **Control IQ+**

- Automated system will communicate with the CGM to adjust every 5 minutes
- Can give auto bolus doses when blood sugar is above target range.
- Adjust basal rates automatically based on CGM data.
- Pump can be placed in "sleep mode" to prevent corrections while sleeping and only adjust basal rates.
- Pump can be placed in "exercise mode." This will prevent corrections and increase target to prevent hypoglycemia.
- DME or pharmacy benefit



OMNIPOD 5

Pods are controlled by either the provided PDM controller or a mobile app (compatibility varies between Android vs iPhone). Must be within 5 feet of app or PDM to change settings or bolus insulin

Compatible CGM's:

- Dexcom G7 10 day or 15 day
- Libre 2+ or Libre 3+

Pods are:

- Waterproof
- Disposable and thrown away after each use- every 2-3 days.
- PDM is not waterproof and must be charged by plugging into USB plug
- Minimum fill: 85 units' Maximum fill: 200 units
- Minimum total daily dose: 5 units

FDA approved for 2 years of age and older

Source: omnipod.com

Algorithm – **Smart Adjust**:

- Increases, decreases, or pauses basal delivery every 5 minutes based on glucose values
- Will **not** give auto bolus for high blood sugar
- Learning algorithm adjusts with every pod change, updates based on glucose patterns
- Can set "activity mode" to raise glucose target
- Pharmacy benefit



BETA BIONICS ILET

Controlled with touch screen or mobile app

Compatible CGM:

- Dexcom G7, 10 or 15 day wear
- Libre 3+

If no CGM data for 72 hours, then the pump will stop working and the patient is required to go back to MDI

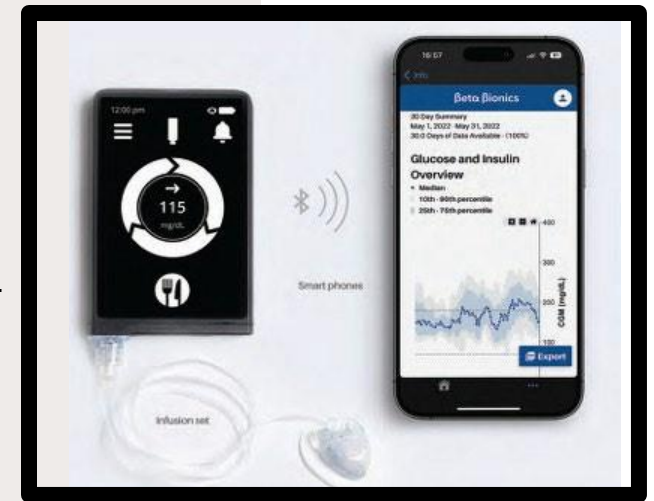
Minimum fill: 180 units and holds up to 180 units.

Water resistant to 12 feet up to 30 minutes at a time.

Has an app that allows up to 10 followers to see pump data.

Algorithm:

- No carb counting
- No corrections
- DME benefit
- The algorithm takes the information from your CGM to continuously make all insulin adjustments.
 - Only setting that can be adjusted is target blood sugar (110 to 130).
- Only user responsibility is to "announce" meal doses as:
 - Less than normal
 - more than normal



FDA approved for 6 years and older
Source: Betabionics.com

SEQUEL TWIIST

Controlled with mobile app and Apple smart watch

Compatible CGM:

- Libre 3+

Holds up to 300 units.

- Not waterproof
- Uses rechargeable batteries

Algorithm- Tidepool Loop

- Adjustable target range from 87mg/dL to 180mg/dL
- Has sound wave technology that detects insulin blockages
- Allows retroactive carb entries
- Activity mode
- No automatic correction boluses
- Has a follow up, but no alerts at this time
- Not covered by medicaid at this time
- Pharmacy benefit



FDA approved for 6 years and older
Source: [twiist.com](https://www.twiist.com)

METRONIC MINIMED 780G

Pairs with Guardian 4 CGM
and the Abbott Instinct CGM

Minimum: 8 units of insulin per day

Sharing: uploads to Carelink Cloud
every night

Alerts can be sent to up to 5 people

Features:

- Finger stick required to start.
- SmartGuard: No additional finger sticks needed.
- Meal detection technology with automatic adjustments
- Correction every 5 minutes
 - Uses stronger corrections while blood glucose is rising
- Extended infusion set can be worn up to 7 days.



FDA approved for 7 years of age and older