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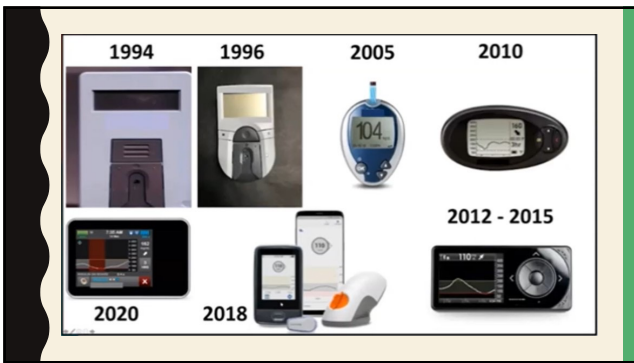
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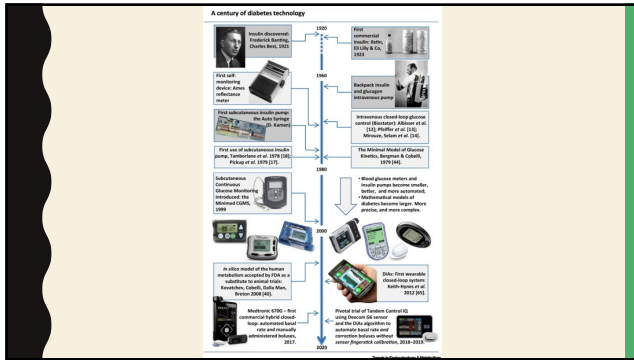
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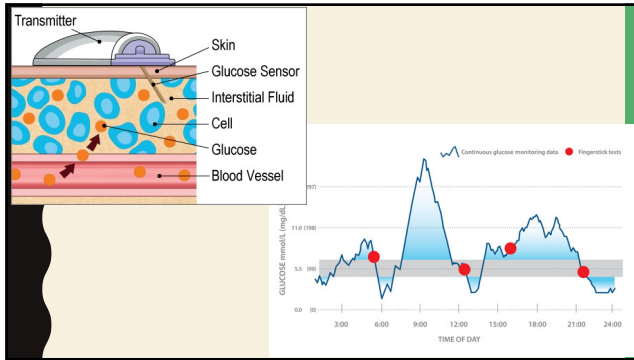


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WHAT IS CGM?

- A sensor (thin filament) that measures the glucose level of interstitial fluid under the skin
- Measures interstitial fluid glucose levels every 5 minutes/24 hours a day while worn (288 BGs a day!)
- May or may not have alarms
- Used to identify trends and patterns of glucose fluctuations
- Some are approved to replace fingersticks (Dexcom G6 & G7/Freestyle Libre, Libre 2, Libre 3)
- Blood sugars shown on a screen of pump, phone, or receiver, as a number and/or graph
 - Arrows show direction and speed blood sugars are moving
 - Approved to wear sensor 7 – 180 days, depending on the brand
 - Alerts can be set to notify wearer of low or high blood sugars on some models
- Types:
 - Medtronic Guardian Connect
 - Dexcom G6 & G7
 - Freestyle Libre, Libre 2, Libre 3
 - Eversense & Eversense E3 (implantable—not reviewed here today)

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MEDTRONIC GUARDIAN CONNECT

- Uses smart technology to predict where glucoses are headed
- Alerts 10 - 60 minutes before a glucose excursion
- Bluetooth reads to a phone app
- 5-7 day wear
- Need to charge transmitter
- Needs 2 calibrations per day
- Automatically uploads to CareLink system
- Sugar.IQ – uses IBM Watson technology to analyze glucose levels and reactions to food, insulin, and other factors
- Has “follow” capabilities

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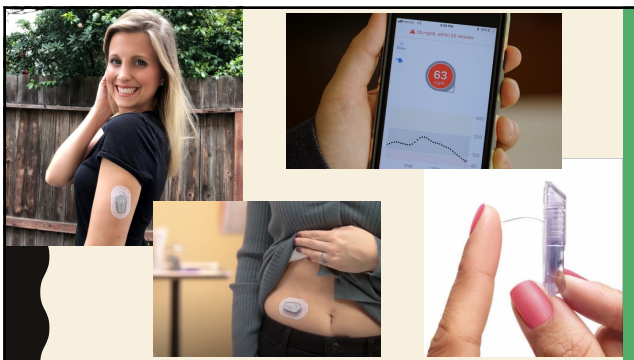
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DEXCOM G6



- Customizable alarms can be turned on and off
- Predicted Urgent Low alarm (under 55 in 20 mins)
- No calibrations**
- Replaces fingersticks**
- Approved to dose off of**
- 10 day wear
- No charging transmitter (battery for 90 days)
- Easy insertion device—one step
- Works with many cell phone models, Apple watches, receiver
- Data can be shared (Dexcom Follow/Share)
- Live alarm sharing
- Dexcom Clarity app on phone or Clarity online
- Siri will verbally give blood sugar reading on iPhones
- For visually impaired, connect to Sugarmate app on phone and then enable Sugarmate Skill on Alexa to ask what BG is
- Integrated with Tandem x2 pumps and Omnipod 5

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DEXCOM G7

- Approved November 2022—launched 2/17/23!
- **MARD 8.1% adults, 8.2% pediatrics** (vs 9% G6)
- 10 day wear (possible 14-15 day in future!)
- 12-hour grace period to replace finished sensors
- **Sensor/transmitter 1 piece**—dispose whole unit after wear (60% smaller!)
- **Faster warm up time—30 mins vs 2 hours**
- **No calibrations**
- **Replace fingersticks/Make dosing decisions**
- Approval for wear of back of arm (better accuracy)
- 90 degree insertion—less trauma/better accuracy
- More alert options
- Smartphone app or receiver
- Will integrate with Tandem and OP5






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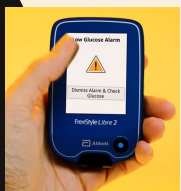





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LIBRE 2

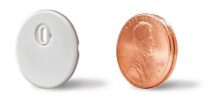


- Has high and low alarms, but **no automatic display/real time**
 - **Still have to scan sensor to see BG**
- Receiver and phone app
 - Receiver is Blue in color and says Libre 2
- Downloads to LibreView account (automatic by app)
- Approved ages 4 years and up
- Improved accuracy vs original Libre
- Same price as original Libre (much more affordable than Dexcom)
- 14 day wear: **back of arm only**
- Sensor and transmitter 1 piece—disposable
- **No calibrations, replaces fingersticks, can dose off of**
- >500mg Vitamin C will give false high readings
- Recent approval for pregnancy and FDA greenlight for integration with AID systems (aka pumps)
- Sharing capability
- Text to talk feature on app
- 'Check Glucose' symbol for rapidly changing BG

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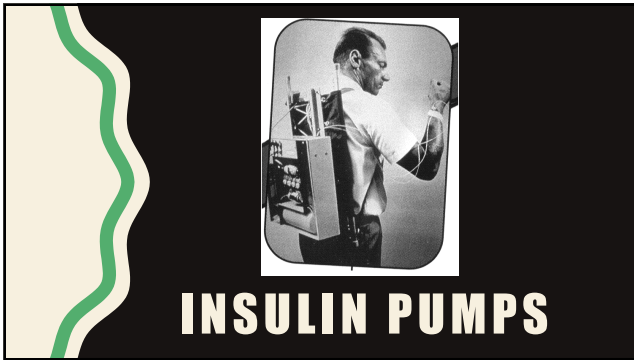
LIBRE 3

- ☐ Approved by FDA May 2022 (started release Fall 2022)
- ☐ MARD 7.9% overall (9.2% in adults)
- ☐ Approved ages 4 and older
- ☐ 14 day wear, back of arm
- ☐ **No calibrations**
- ☐ **Replaces fingersticks**
- ☐ **Much smaller! 2 stacked pennies**
 - ☐ Smallest and thinnest available on market
- ☐ **Real time readings—no more scanning!**
- ☐ Customizable alarms
- ☐ Data transmitted to smartphone **every 60 seconds** (Libre 3 app)
- ☐ Same price as previous versions
- ☐ 33 feet Bluetooth span (vs 20 feet with others)
- ☐ Still 1 piece applicator and all in 1 sensor/transmitter
- ☐ Recent approval for pregnancy and FDA greenlight for integration with AID systems (aka pumps)

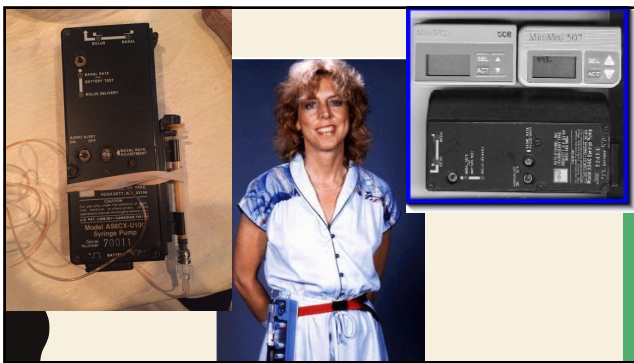
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ALL ABOUT INSULIN PUMPS

Dosage instructions are entered into the pump's small computer and the appropriate amount of insulin is then injected into the body in a calculated, controlled manner.

#ADAM

- Delivers rapid acting insulin through an infusion set
 - No long-acting insulin**
- Infusion set is connected to a tiny plastic cannula or small steel needle that is inserted under the skin to deliver insulin on a continuous basis
- Infusion sets are changed every 2-3 days
- Rapid-acting insulin is drawn up in a reservoir/cartridge

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INFUSION SET*

- Tubing carries insulin from the pump to you.
- Reservoir: Connector end of the tubing that fits into the reservoir which holds the insulin.
- Insertion Site Section: other end of the tubing that attaches to you.
- Careful: Try to stick tube placed into your skin! The reservoir needs to be inserted into the insertion site section.
- Adhesive: holds the infusion set in place.
- Reservoir Compartment: part of the pump where the reservoir fits.

*You should replace both the infusion set and the reservoir every 2-3 days.
**Not all infusion sets allow for fluctuations.
***Some infusion sets do not use a cannula but have a small needle that enters your abdomen.

RESERVOIR

PUMP

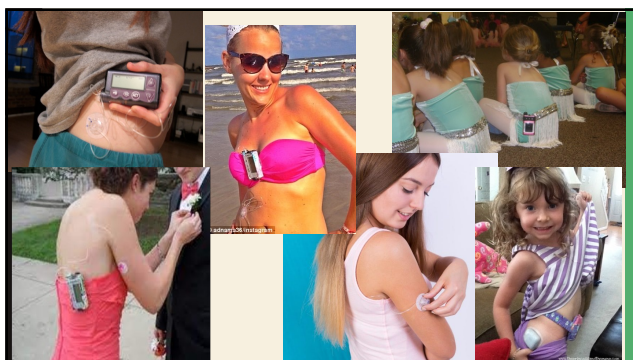
- The pump is programmed per physician's orders:
 - Basal Rates
 - Insulin to carb ratio
 - Correction/Sensitivity factor and Target BG
- Mimics normal physiologic insulin delivery
- Sites worn same areas injections given
- Gives insulin continuously over 24 hours – basal rates
 - Adjustable to different times of day and insulin needs
- For meals or high BG can give a dose of insulin – bolus
- Uses a "bolus calculator" to calculate the proper dose based on the regimen and the inputted blood sugar and grams of carbs
- Battery operated or chargeable

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CLOSED LOOP PUMPS (CLPS)

- CLP = Closed Loop Pump
- A system that works with both a CGM and a pump (integrated—CGM "talks" to the pump)
- The pump automatically adjusts the amount of insulin given (both basal and bolus) depending on the specific system algorithm and what the CGM value is
- CLPs are fantastic technology, they do a lot in the background to help prevent both highs and lows
- Current systems:
 - Medtronic CLP: Medtronic 670G or 770G with Auto Mode
 - Tandem CLP: Tandem t:slim X2 with Control IQ (CIQ)
 - OmniPod CLP: OmniPod 5 (OP5)

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INFUSION SETS

- A soft, plastic subcutaneous cannula or steel needle inserted at a 90 or 30/45 degree angle by the parent/child
 - Plastic cannula works like an IV—needle goes in and comes out, leaving cannula in place
- An inserter is available for most sets or are incorporated in the set
- Some use a steel needle which remains in the subcutaneous tissue
- All infusion sets should be changed every 2- 3 days
 - Can place a site anywhere give an injection
 - Site rotation is still KEY!
- Possible to disconnect from pump without removing the site

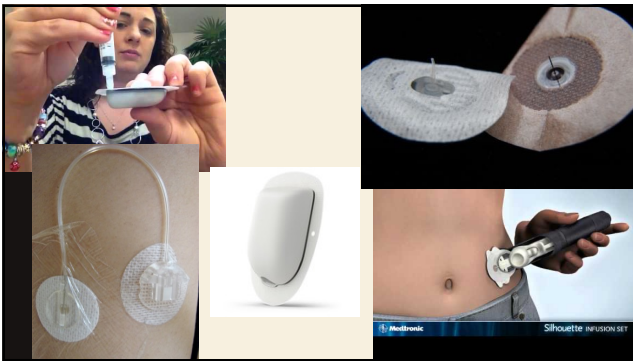
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MEDTRONIC 630G & 670G

- First hybrid closed loop (CLP) pump released in US in March 2017
- Uses Medtronic Guardian 3 CGM (5-7 day wear)
- 3 modes of operation
 - Manual Mode – acts like regular pump
 - Suspend before low (SBL) – when used with Medtronic Guardian CGM – if algorithm predicts low within 30 minutes, pump will suspend basal insulin until glucose begins to rise
 - Auto Mode (670G) – pump looks at q5 minute CGM readings and rather than giving basal insulin, administers micro-boluses, every 5 minutes based on trends of glucose (present, past, direction & speed of movement of BG)
- Holds up to 300 units of insulin
- Plastic cannula and steel infusion set options

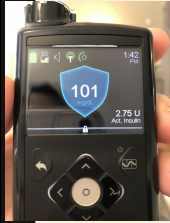
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670G AUTO MODE

- Glucose target is 120 mg/dL
- A temporary target of 150 mg/dL can be set for activity
- Must calibrate CGM daily
 - 2 calibrations when in Manual Mode
 - 3-4 calibrations when in Auto Mode
- Carbs must be counted and entered
- Must pre-meal bolus!
- Pump recommendations for carbs and BG cannot be altered

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670G AUTO MODE



- If glucose is high for 4 hours, a calibration must be done or pump enters "Safe Basal"
- If glucose is low for 2.5 hours, a calibration must be done or pump enters "Safe Basal"
- "Safe Basal" is a calculated rate based on the present glucose as well as the trend of the glucose. Lasts for 90 minutes, then pump reverts to Manual Mode if not calibrated/fixes.
- Can get kicked out of Auto Mode for various reasons—look at shield on home screen



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MEDTRONIC 770G

- Uses Guardian 3 Sensor and Guardian Link 3 Transmitter (updated transmitter)
- Still has 3 modes: Manual, SBL, Auto Mode (all function the same as previous series)
- Requires 2-3 calibrations a day
- 5-7 day wear on sensor
- Bluetooth enabled – phone app shows pump screen and connects continuously to CareLink upload
 - Has follow feature for caregivers/SO/family
- Enabled for software upgrades

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TANDEM T:SLIM X2 BASAL IQ & CONTROL IQ



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TANDEM T:SLIM X2

- ❑ First touch screen and rechargeable pump
- ❑ Released 2016
- ❑ Software is upgradeable via computer connection
 - ❑ First pump capable of receiving software upgrades
- ❑ Holds 300 units of insulin via cartridge
- ❑ Plastic cannula and steel infusion set options
- ❑ 2 software formats: Basal IQ or Control IQ (CLP)

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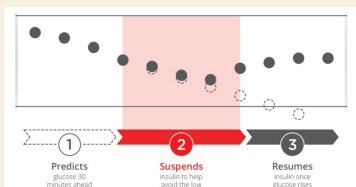
TANDEM T:SLIM X2 BASAL IQ



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BASAL IQ

- ❑ Pump has an algorithm using Dexcom G6 to predict lows
- ❑ Integrated with Dexcom G6
- ❑ Uses real time sensor data and predicts glucose 30 minutes ahead
- ❑ Will suspend basal insulin if BG is <70 OR predicted to be <80 in next 30 minutes
- ❑ Assesses in 5 minute increments
- ❑ Turns back on once predicted BG is rising



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TANDEM T:SLIM X2 CONTROL IQ

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How Does Control-IQ Technology Work?

Control-IQ™ technology is designed to help increase time in range (70–180 mg/dL) using Dexcom G6 continuous glucose monitoring (CGM) values to predict glucose levels 30 minutes ahead and adjust insulin delivery accordingly, including delivery of automatic correction boluses (up to one per hour).

	Control IQ	Sleep Activity	Exercise Activity
Delivers Delivers an automatic correction bolus if sensor glucose is predicted to be above ____ mg/dL	180	---	180
Increases Increases basal insulin delivery if sensor glucose is predicted to be above ____ mg/dL	160	120	160
Maintains Maintains active Personal Profile settings when sensor glucose is between ____ - ____ mg/dL	112.5 - 160	112.5 - 120	140 - 160
Decreases Decreases basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	112.5	112.5	140
Stops Stops basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	70	70	80

*As measured by CGM.

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T:CONNECT MOBILE APP

- All Tandem x2 pumps have the ability to connect via Bluetooth to phone app
- App provides viewer with pump home screen info, Dexcom G6 readings and graph, IOB, and all current Status info
- Uploads wirelessly to t:connect and can be connected to HCP office
- Pump alerts/alarms sent as notifications on phone
- Can bolus from phone app!**

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OMNIPOD

- Only tubeless pump
- All systems use PDM (Personal Diabetes Manager) that controls pod
- Pod changed q 2-3 days, waterproof
- Pod holds 200 units
- Pod=pump and functions same as other pumps (basal rates, bolus via PDM)
- Easier fill process, PDM primes and inserts cannula
- PDM can deliver bolus as long as within 5-6 feet
- Eros and DASH not CGM integrated; OP5 is CLP and integrated with Dexcom G6
 - Many podders use Dexcom independently of pump on their phone so they can still get CGM alerts

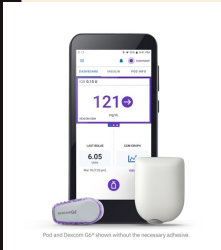
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OMNIPOD DASH

- DASH PDM is touch screen and Bluetooth technology, WiFi enabled (download software updates)
- PDM is "locked down" Android phone (cannot text/call, download apps)
- WiFi – will allow software updates
- "View" app for caregivers – will allow remote monitoring (cannot bolus remotely)
- "Display" app on phone allows to view current status of pump/PDM
- Built in CalorieKing food library with insertion of carbs into carb calculator accessible in bolus calculator

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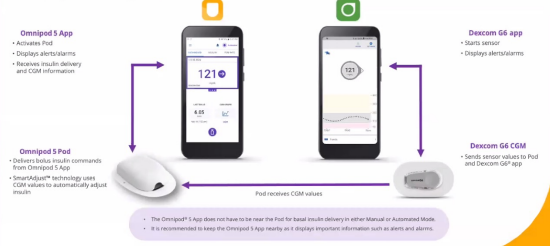
OMNIPOD 5 (OP5)



- ❑ Omnipod's HCL system—FDA approved January 2022 (full market release summer/fall 2022)
 - ❑ Age 2 years and older
 - ❑ Integrated with Dexcom G6
- ❑ New pods and PDM
- ❑ Set for: full control on mobile app (remote bolusing)—Android only right now, working on Apple version
- ❑ 2 modes: Automated Mode and Manual Mode
- ❑ Every 5 minutes, SmartAdjust™ technology receives a CGM value and predicts where the BG will be in 60 minutes into the future
 - ❑ Then, increases, decreases, or pauses automated insulin delivery based on target set in pump
- ❑ Adjustable target 110-150, can adjust by time of day
- ❑ Exercise feature called "HypoProtect"—allows temp target set at 150 and restricts insulin delivery
- ❑ Built in SMART Bolus calculator that is informed by BG and trends
- ❑ Cannot get "kicked out" of Automated Mode (Limited Mode)
- ❑ Algorithm updates after each pod change (takes few weeks to learn person and become more aggressive)


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Omnipod® 5 System Communication




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THERE'S AN APP FOR THAT...DEMOS!




csimulator




MiniMed Virtual Pumps



Omnipod 5 Simulator



Dexcom G6 Simulator



*Not simulators
FreeStyle Libre 2 & 3

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CHECK OUT COMPANY WEBSITES!

- All manufacturer websites have:
 - full User Guides as PDFs
 - Medtronic has specific School Nurse Guides!
 - Quick Reference Sheets/Guides
 - YouTube videos
 - Tutorials
 - FAQs
 - Plus, 24/7 Tech Support phone #s!



- Medtronic: <https://www.medtronicdiabetes.com/download-library>
- Tandem: <https://www.tandemdiabetes.com/providers/education-and-resources/training>
- Omnipod: <https://www.omnipod.com/current-borders/resources>
- Dexcom: <https://www.dexcom.com/en-us/guides>
- Libre: <https://www.freestyle-abbott/us/en/support.html>

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