CGMS and Insulin Pumps

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Conflict of Interest--None

Objectives

1. Overview of features of CGMS
2. Benefits and considerations for the use of CGMS
3. Discuss features of available professional and personal CGMs and insulin pumps.
4. Insulin pump features
5. Advantages & barriers: use of insulin pumps

CGMs

- No or few finger Sticks
  - Show glucose levels in real time or by scanning a glucose sensor to get the reading.
  - Measures interstitial fluid to determine BG
  - Tiny sensor under skin sends BG levels wirelessly to a pump, smartphone or other device

- Alarms
  - CGMs can alert you when your glucose is rising or falling rapidly, and when you hit a high or low limit, giving you an advanced warning to prevent low or high blood sugar (blood glucose).
- Trends
  - They also give you an idea about trends with your blood sugar levels that can help inform you and your diabetes team about changes that could help you reach your targets.
- Pumps
  - Several CGMs connect to insulin pumps and some use CGM data to automatically adjust background (basal) insulin, deliver a correction (bolus) dose of insulin, or temporarily stop insulin delivery if glucose drops too low.

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CGMS

- CGM should be considered in children to adults
- Useful tool in those frequent hypoglycemia or hypoglycemia unawareness (alarm features)
- Measures percent of time in, above and below range

Benefits of CGM

- Significant reductions in hypoglycemia Type 1
  - 38% reduction of overall hypo
  - 40% reduction of nighttime hypo
- Type 2 less hypo too
  - 43% reduction overall hypo
  - 54% reduction in nighttime hypo

AADE Practice Paper; The Diabetes Educator Role in Continuous Glucose Monitoring, July 2018

CGMS: Professional

- Person with diabetes is outfitted with CGM for 3-14 days
- Readings are collected every 1 to 5 minutes
- Retrospective data downloaded to review and make treatment adjustments – Diabetes educator familiar with software and downloading.
- Blinded CGM – user can't see results and therefore they don't alter behavior
  - Unblinded – user sees glucose reading in real time on receiver and can take action
- Is billable for provider

- 2 major brands.
- 1 can be blinded or unblinded to the patient.
- Other can only be blinded to the patient

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CGMS: Personal

time

Abbott FreeStyle Libre 2

Abbott Diabetes Care

Type: Stand-alone CGM

Sensor Duration: 14 days

Features

Calibration Required: No

Finger-Stick Confirmation Required: No

Long Transmitter Range: Yes

Short Warm-Up Time: Yes

Transmits Data Continuously: No

Built-In Meter: Yes

Wirelessly Communicates With Meter: No

Approved for Use in Kids Under 18: Yes

Sends Data to Smart Device: No

Shares Data With Family Via App: No

Dexcom G6 CGM System

Dexcom

Type: Stand-alone or Integrated CGM

Sensor Duration: 10 days

Features

Calibration Required: No

Finger-Stick Confirmation Required: No

Long Transmitter Range: Yes

Short Warm-Up Time: Yes

Transmits Data Continuously: Yes

Built-In Meter: No

Wirelessly Communicates With Meter: No

Approved for Use in Kids Under 18: Yes

Sends Data to Smart Device: Yes

Shares Data With Family Via App: Yes

Eversense CGM System

Senseonics

Type: Stand-alone CGM

Sensor Duration: Up to 90 days

Features

Calibration Required: Yes

Finger-Stick Confirmation Required No

Long Transmitter Range: Yes

Short Warm-Up Time: No

Transmits Data Continuously: Yes

Built-In Meter: No

Wirelessly Communicates With Meter: No

Approved for Use in Kids Under 18: No

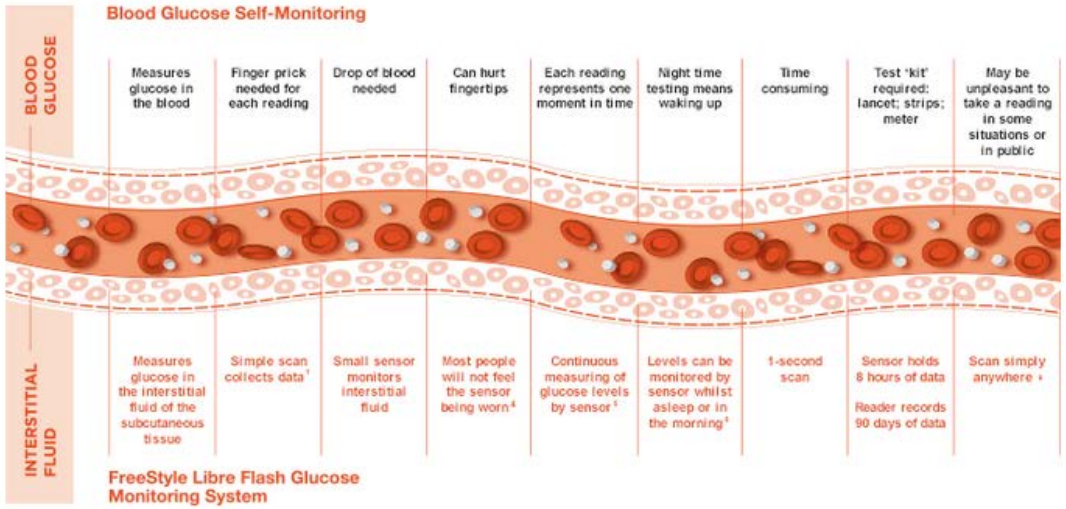
Sends Data to Smart Device: Yes

Shares Data With Family Via App: Yes

https://consumerguide.diabetes.org/

CGMS: Personal

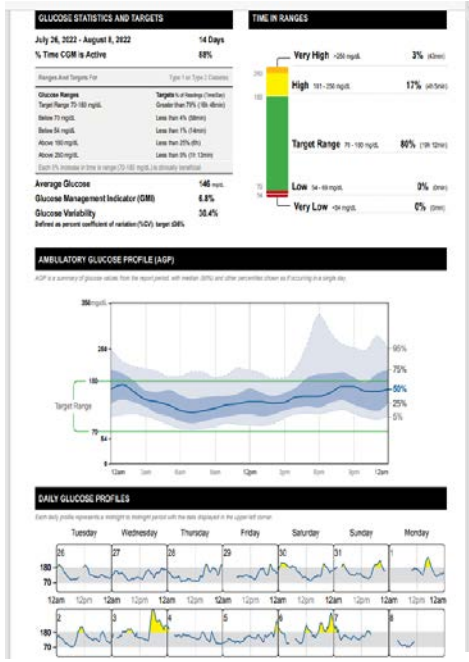
- Benefits include less time in hypo /hyper glycemia
- A1c improvements
- Warning – rapid glucose changes
- Real time data
- 5-10 minute lag between BG and Interstitial Glucose (SG)

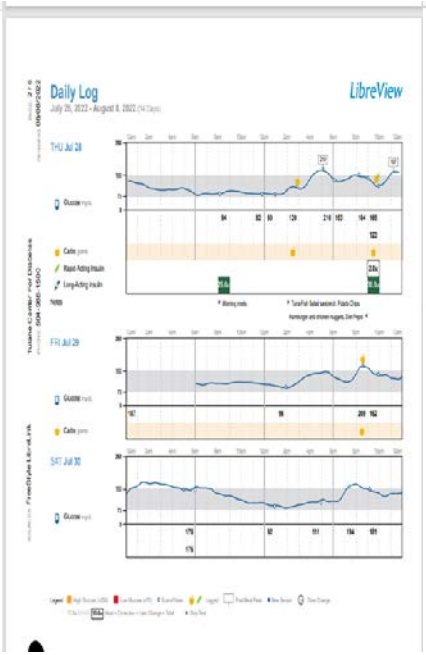


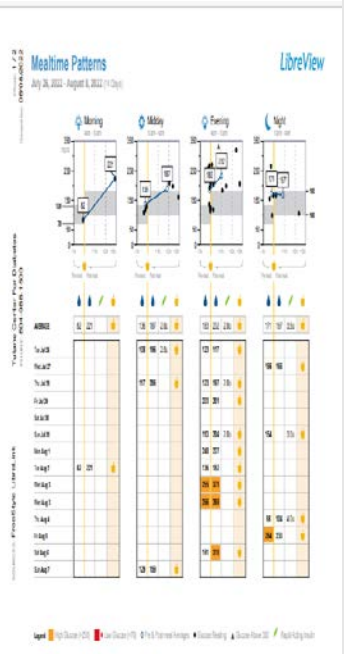
CGMS: Considerations

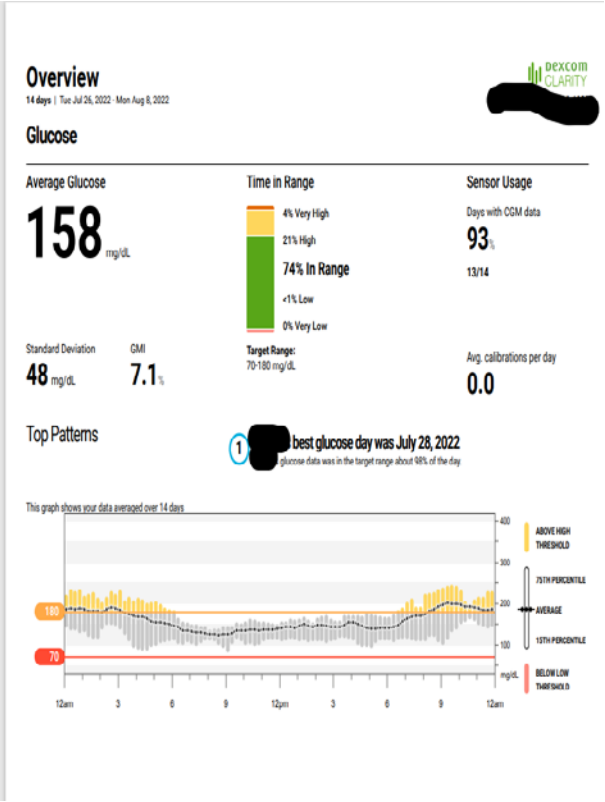
- CGM decreases need for BG Checks.
- But, following situations warrant a fingerstick:
  - Calibration or BG symbol appears on screen
  - Symptoms don’t match CGM readings
- Be on look our for alarm distress/burnout

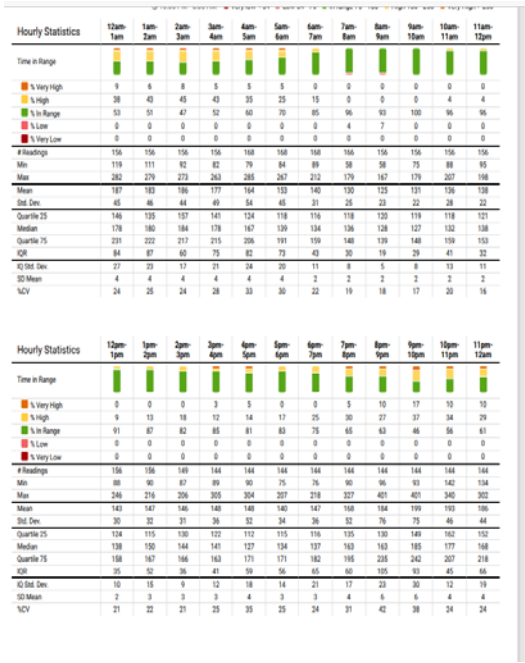
CGMS: Reports







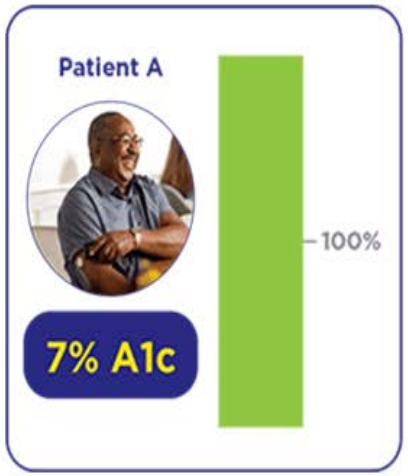


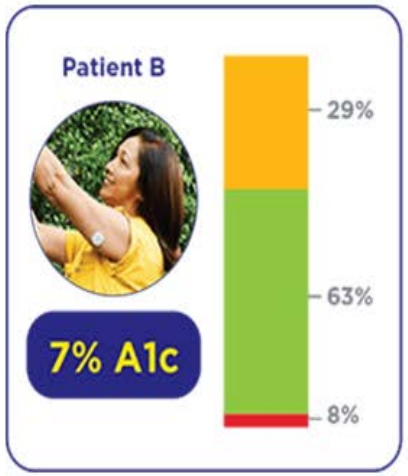


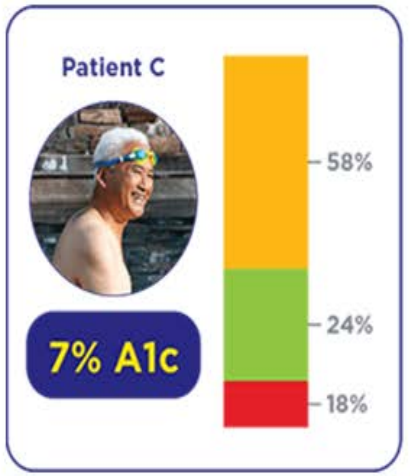
WELL-AHEAD

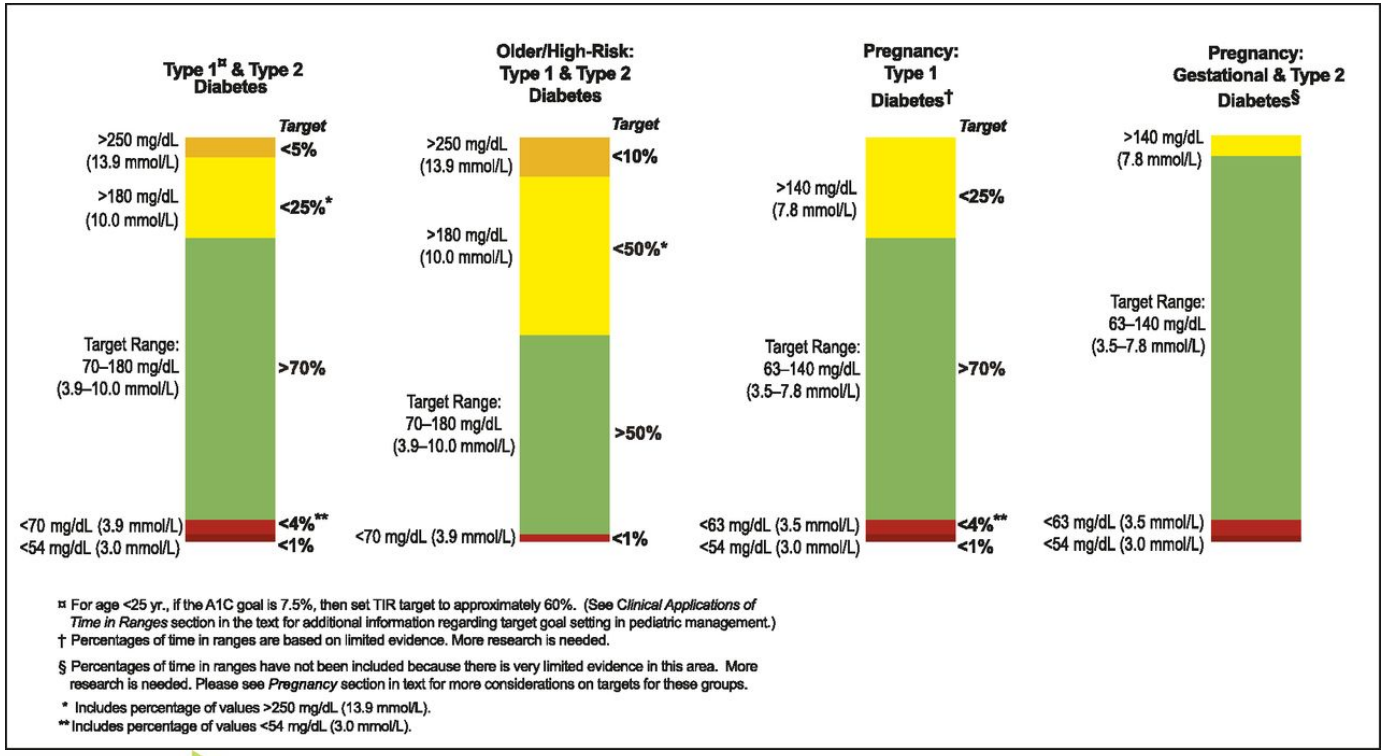
Project ECHO

CGMS: Reports







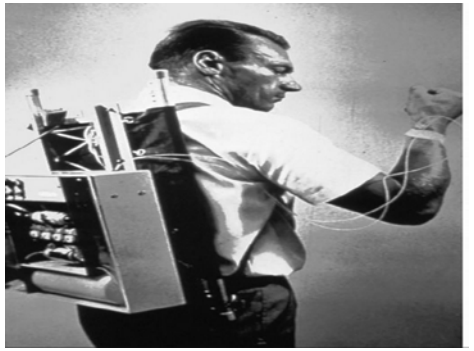


https://www.freestyleprovider.abbott/us-en/what-is-cgm.html?gclid=EAIaIQobChMI0YTTu7_J-QIVnhXUAR13AQQVEAAYASAAEgKNO_D_BwE&gclsrc=aw.ds

Diabetes Care. 2019;42(8):1593-1603. doi:10.2337/dci19-0028

Insulin Pumps

- An insulin pump continuously releases short- or rapid-acting insulin throughout the day and night to help you reach your blood sugar (blood glucose) targets.
- Meal and correction insulin can be delivered with ease by pushing buttons.
- Wearing a pump can give you more freedom with your meal planning and physical activity.
- It may also lead to increasing the amount of time you spend in your target blood sugar range (usually 70–180 mg/dL) over time and lowering your A1C.
- There are two types of insulin pumps: those connected to the body with tubing or worn directly on the body.
- Several insulin pumps communicate with a continuous glucose monitor (CGM).
- These pumps may use CGM glucose data to automatically adjust background (basal) insulin, deliver a correction (bolus) dose of insulin or temporarily stop insulin delivery if glucose drops too low.



Evolution of Insulin: From Human to Analog. Joseph M. Tibaldi, MD
American Journal of Medicine, 2014

Insulin Pumps

MiniMed 770G System

Medtronic

300-unit reservoir

Features

Combo pump-CGM: Yes

Tubing Required: Yes

Auto Basal Insulin Suspension: Yes

Insulin-to-Carb Ratio in Fractions: Yes

Built-In Meter: No

Communicates With Meter: Yes

Contains Food Database: No

View Data Via Smartphone App: Yes

Shares Data With Family Via App: Yes

Approved for Use In Kids Under 18: Yes

Remote Bolus Function: No

Remote Updates Option: Yes

Omnipod Dash

Insulet Corp.

200-unit reservoir built into Pod

Features

Combo pump-CGM: No

Tubing Required: No

Auto Basal Insulin Suspension: No

Insulin-to-Carb Ratio in Fractions: No

Built-In Meter: No

Communicates With Meter: Yes

Contains Food Database: Yes

View Data Via Smartphone App: Yes

Shares Data With Family Via App: Yes

Approved for Use In Kids Under 18: Yes

Remote Bolus Function: Yes

Remote Updates Option: Yes

t:slim X2 Insulin Pump With Control-IQ

Tandem Diabetes Care

300-unit reservoir

Features

Combo pump-CGM: Yes

Tubing Required: Yes

Auto Basal Insulin Suspension: Yes

Insulin-to-Carb Ratio in Fractions: Yes

Built-In Meter: No

Communicates With Meter: No

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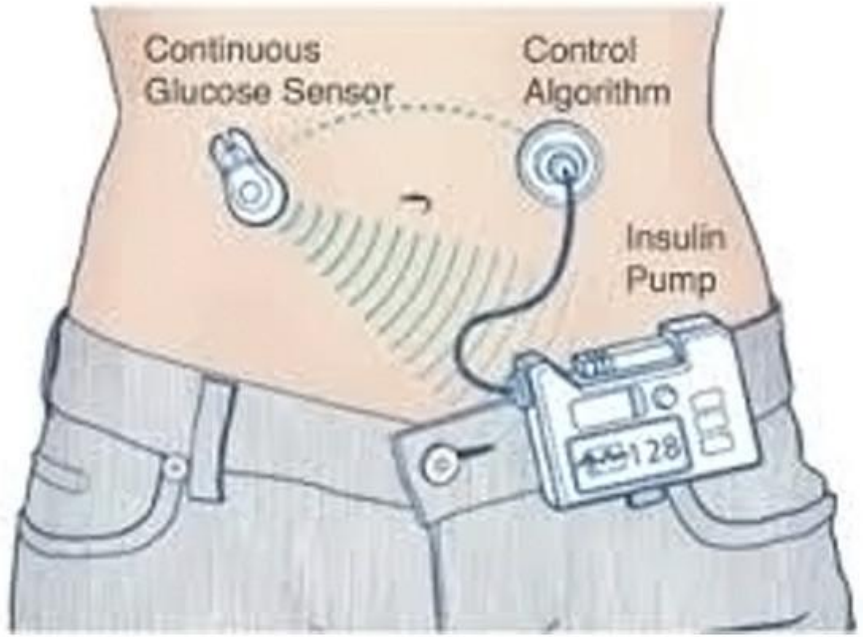
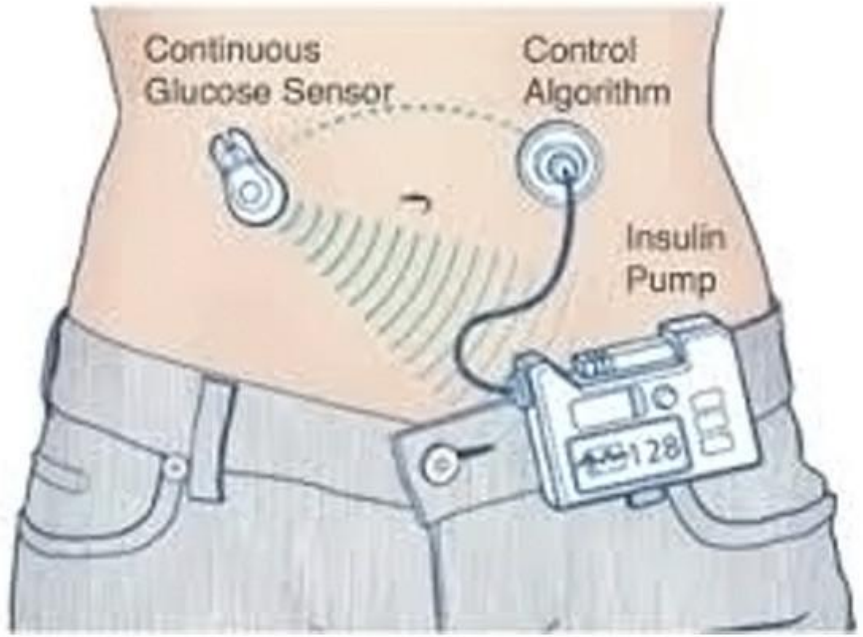
Advantages of Pump therapy



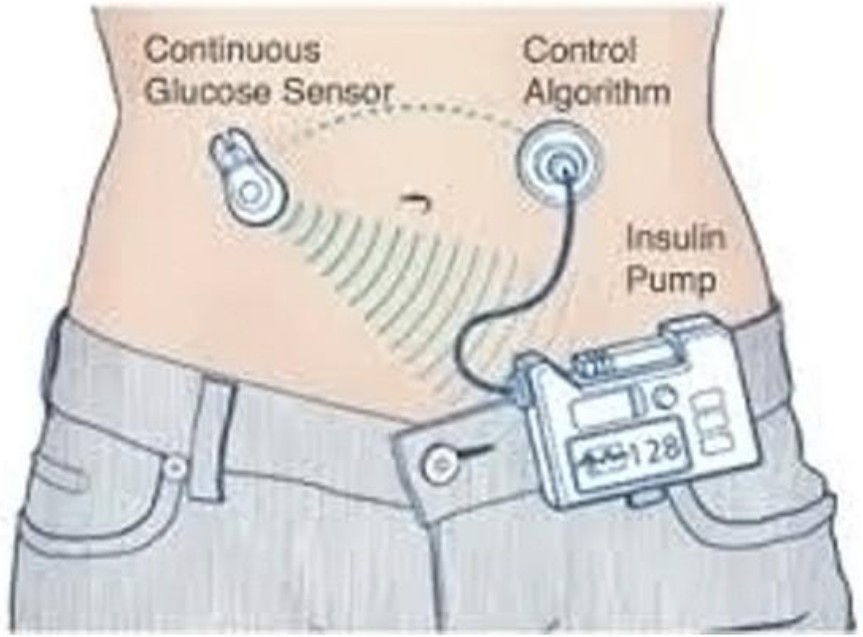
- A1c improvement
- Less glucose variability
- Reduction in duration and frequency of severe of hypo
- 50% drop in severe hypoglycemia
- Quality of life improves
- Precise can deliver .05, .025, or .01 units

Insulin Pump Barriers



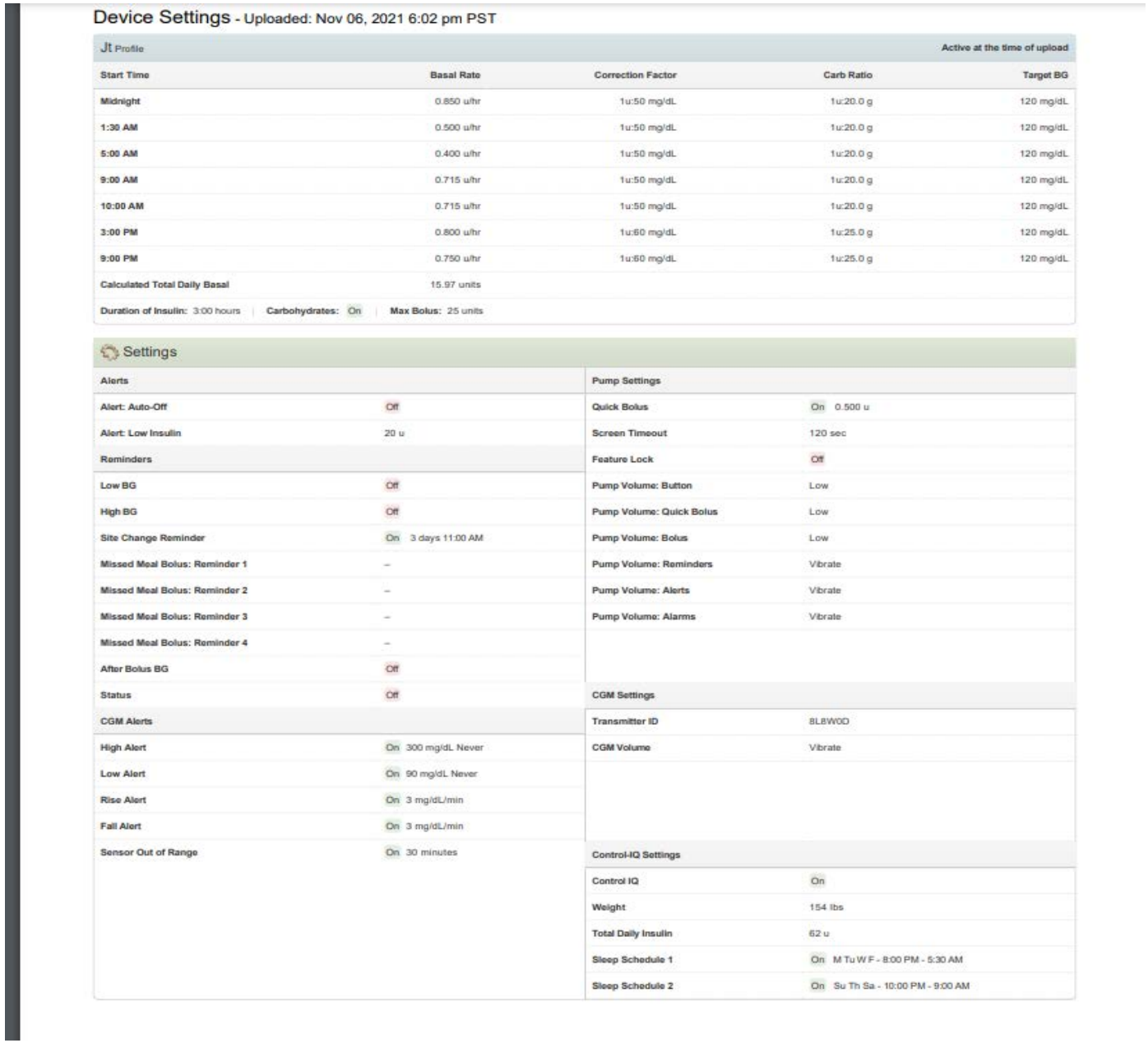
- Standard pump cost
  - Getting started cost $5,000 -$7,000 for pump (avg $6,000)
  - Supplies 1-2 thousand dollars a year (200 a month)
- Other costs, extra test strips, cgm sensors, transmitters, accessories
- Weight gain
  - Easier to eat spontaneously
- Changes infusion set and tubing 5-10 mins
- More provider time
- Persistence and careful monitoring –no long acting insulin

Insulin Pump Barriers



- How much insulin does it hold?
- CGM results displays on pump screen
- Reminder options
- Remote on glucose meter, device, apps, smart phones
- Ease of data download and readability
- How does it look, feel, clip features
- Alarms and other features

Insulin Pump Report



Device Settings - Uploaded: Nov 06, 2021 6:02 pm PST

Jt Profile — Active at the time of upload

Start Time	Basal Rate	Correction Factor	Carb Ratio	Target BG
Midnight	0.850 u/hr	1u:50 mg/dL	1u:20.0 g	120 mg/dL
1:30 AM	0.500 u/hr	1u:50 mg/dL	1u:20.0 g	120 mg/dL
5:00 AM	0.400 u/hr	1u:50 mg/dL	1u:20.0 g	120 mg/dL
9:00 AM	0.715 u/hr	1u:50 mg/dL	1u:20.0 g	120 mg/dL
10:00 AM	0.715 u/hr	1u:50 mg/dL	1u:20.0 g	120 mg/dL
3:00 PM	0.800 u/hr	1u:60 mg/dL	1u:25.0 g	120 mg/dL
9:00 PM	0.750 u/hr	1u:60 mg/dL	1u:25.0 g	120 mg/dL
Calculated Total Daily Basal	15.97 units			

Duration of Insulin: 3:00 hours | Carbohydrates: On | Max Bolus: 25 units

Settings

Alerts	
Alert: Auto-Off	Off
Alert: Low Insulin	20 u
Reminders	
Low BG	Off
High BG	Off
Site Change Reminder	On 3 days 11:00 AM
Missed Meal Bolus: Reminder 1	–
Missed Meal Bolus: Reminder 2	–
Missed Meal Bolus: Reminder 3	–
Missed Meal Bolus: Reminder 4	–
After Bolus BG	Off
Status	Off
CGM Alerts	
High Alert	On 300 mg/dL Never
Low Alert	On 90 mg/dL Never
Rise Alert	On 3 mg/dL/min
Fall Alert	On 3 mg/dL/min
Sensor Out of Range	On 30 minutes

Pump Settings	
Quick Bolus	On 0.500 u
Screen Timeout	120 sec
Feature Lock	Off
Pump Volume: Button	Low
Pump Volume: Quick Bolus	Low
Pump Volume: Bolus	Low
Pump Volume: Reminders	Vibrate
Pump Volume: Alerts	Vibrate
Pump Volume: Alarms	Vibrate
CGM Settings	
Transmitter ID	8L8W0D
CGM Volume	Vibrate
Control-IQ Settings	
Control IQ	On
Weight	154 lbs
Total Daily Insulin	62 u
Sleep Schedule 1	On M Tu W F - 8:00 PM - 5:30 AM
Sleep Schedule 2	On Su Th Sa - 10:00 PM - 9:00 AM

What's covered?

Document everything in detail!

Criteria for coverage for CGMS

- T1DM is covered
- T2DM—varies
  - Usually requires being on insulin but some are accepting any DM injections.
  - History of lows, unawareness and/or at risk of lows.
  - "Due to Covid pandemic, it is medically necessary for patient to use CGMS to manage diabetes."
- Other conditions may require a PA.

Resources

- ADA consumer guide to technology

https://consumerguide.diabetes.org/

- Company web sites – virtual demo
- Diabetes Forecast Consumer Guide
- My TSA Mobile App
- **American Red Cross Shelters:** Contact the American Red Cross directly at 1-800-RED-CROSS.
- **Resource For Health Care Providers**:
  - **Insulin Supply Hotline:** During a disaster, call the emergency diabetes supply hotline 314-INSULIN (314-467-8546) if you know of diabetes supply shortages in your community (i.e. shelter, community center). Hotline is for health care providers only.

Thank You!