Continuous Glucose Monitoring & Insulin Pump Update

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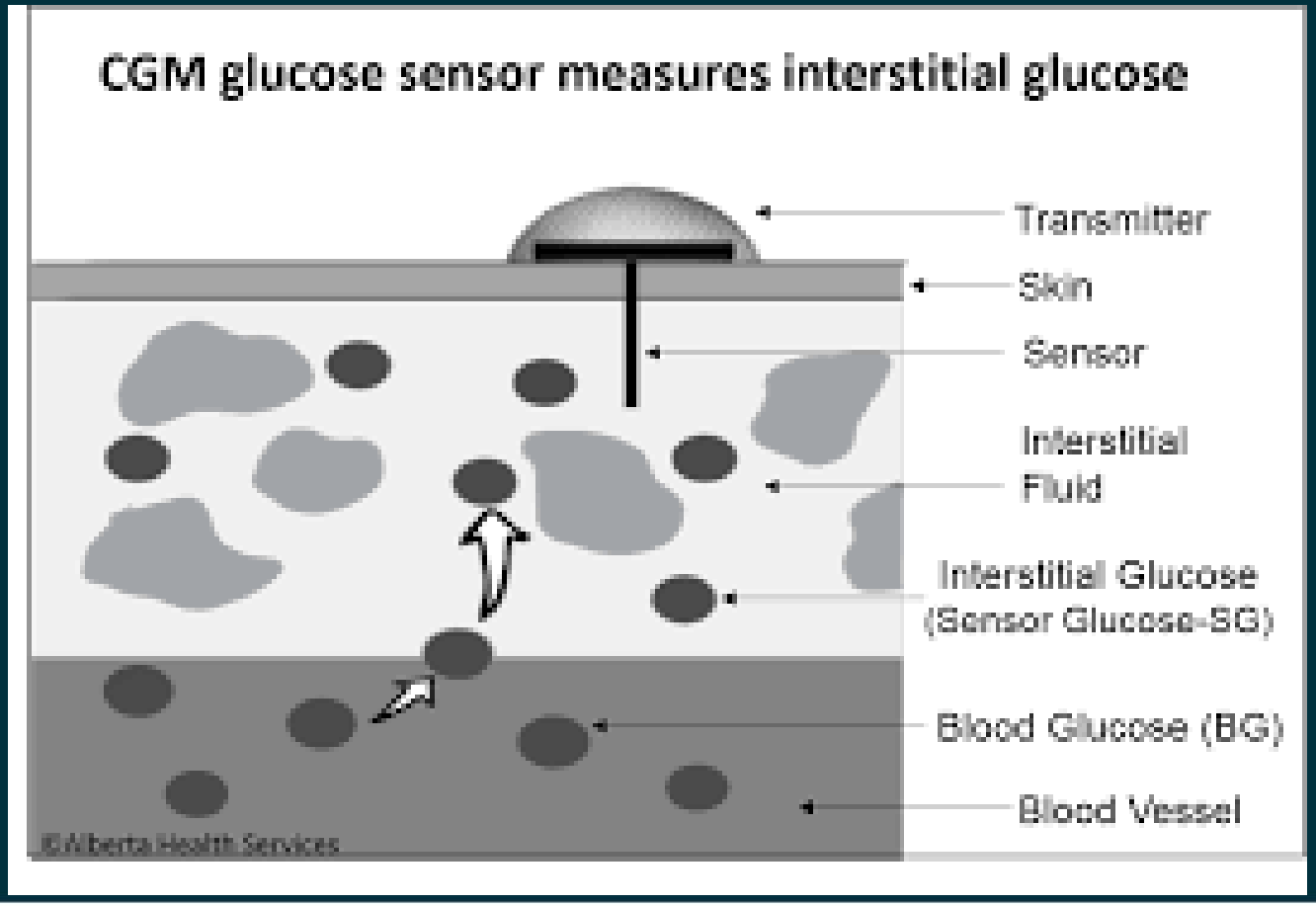
What is Continuous Glucose Monitoring?

- Automatically tracks glucose data either continuously or intermittently depending on the device
- Measures an interstitial glucose & transmits data to receiver or phone that patient can view



[2]

Benefits of CGM Therapy

- A1c does not always tell the whole story
- Elevated blood sugar readings & high A1c associated with increased risk of complications
- Glucose variability also associated with complications
- CGM helps “fill in the gaps of the story” to allow for tighter insulin titration & improved glycemic control
- Glucose alerts & ease of checking glucose gives patients & caregivers peace of mind
- Allows patients to see impact of food choices & exercise on blood sugar readings which can lead to healthier lifestyle changes

More Benefits of CGM Therapy

- Changed every 7-14 days
- Can be used with or without an insulin pump
- May alarm when glucose is too high or too low
- Data can be downloaded & reviewed by health care provider or family
- Empowers the patient with active knowledge

Ideal Patients for CGM

- Type 1 diabetics
- Patients on multiple daily insulin injections
- Frequent hypoglycemia & hypoglycemia unawareness
- Pregnant and insulin
- Patients requiring frequent glucose testing
- Patients on insulin who live alone
- Patients who struggle with dietary choices

Commonly used types of CGM at Monument Health

- Dexcom G6
- Freestyle Libre 2
- Medtronic Guardian

Therapy Goals

- A1c 7.0%
- Time below 54 mg/dL (less than 1%)
- Time below 70 mg/dL (less than 4 %)
- Time in range (70-180 mg/dL), target greater than 70%
- Less stringent goals depending upon life expectancy, safety [3]

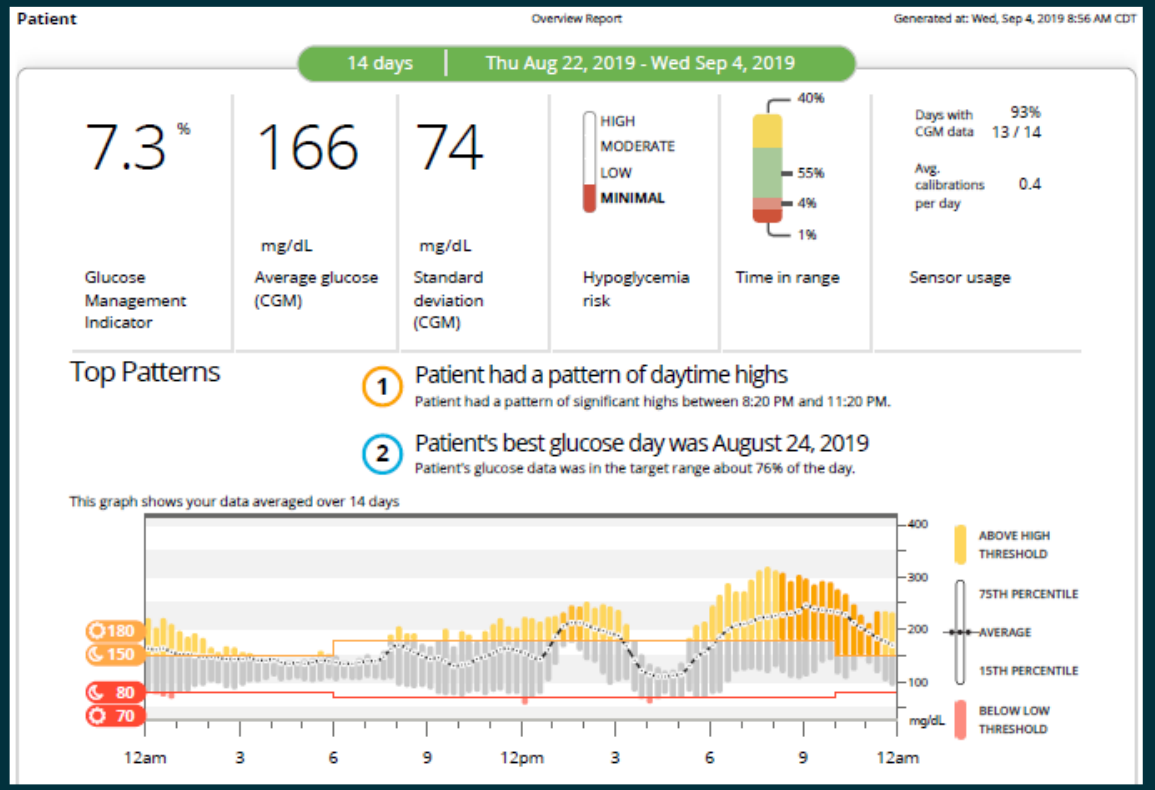
Dexcom G6

- No finger stick calibrations required
- New glucose reading every 5 minutes
- Data automatically transmits to receiver or Smartphone app
- Shareable data with up to 10 people
- Customizable alerts
- Sensors last 10 days, transmitter 3 months
- No interference with acetaminophen
- Insurance and medicare coverage continues to improve
- Coordinates with T-slim insulin pump, “Control IQ”
- Dexcom G6 features an overall MARD of 9.0.[4]

Dexcom G6

[5]

Dexcom G6 example



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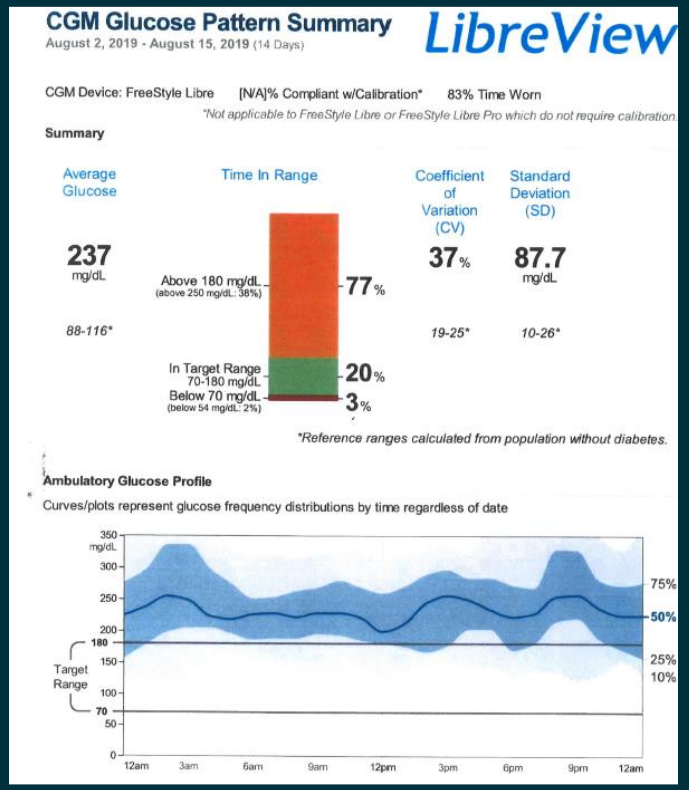
Freestyle Libre 2

[6]

Freestyle Libre 2

- Ability to alert patients to high & low glucose readings (still need to scan)
- iOS compatibility
- Recently received Android compatibility (not all phones)
- High levels of vitamin C can cause false readings
- Recommend double checking hypoglycemic readings with a fingerstick blood glucose
- Cost effective
- Overall MARD 9.2%[7]

Freestyle Libre



CGM Glucose Pattern Summary
August 2, 2019 - August 15, 2019 (14 Days)

LibreView

CGM Device: FreeStyle Libre [N/A]% Compliant w/Calibration* 83% Time Worn

*Not applicable to FreeStyle Libre or FreeStyle Libre Pro which do not require calibration.

Summary

Average Glucose	Time In Range	Coefficient of Variation (CV)	Standard Deviation (SD)
237 mg/dL	Above 180 mg/dL (above 250 mg/dL: 38%) 77%	37%	87.7 mg/dL
*88-116**	In Target Range 70-180 mg/dL 20%	*19-25**	*10-26**
	Below 70 mg/dL (below 54 mg/dL: 2%) 3%		

*Reference ranges calculated from population without diabetes.

Ambulatory Glucose Profile

Curves/plots represent glucose frequency distributions by time regardless of date

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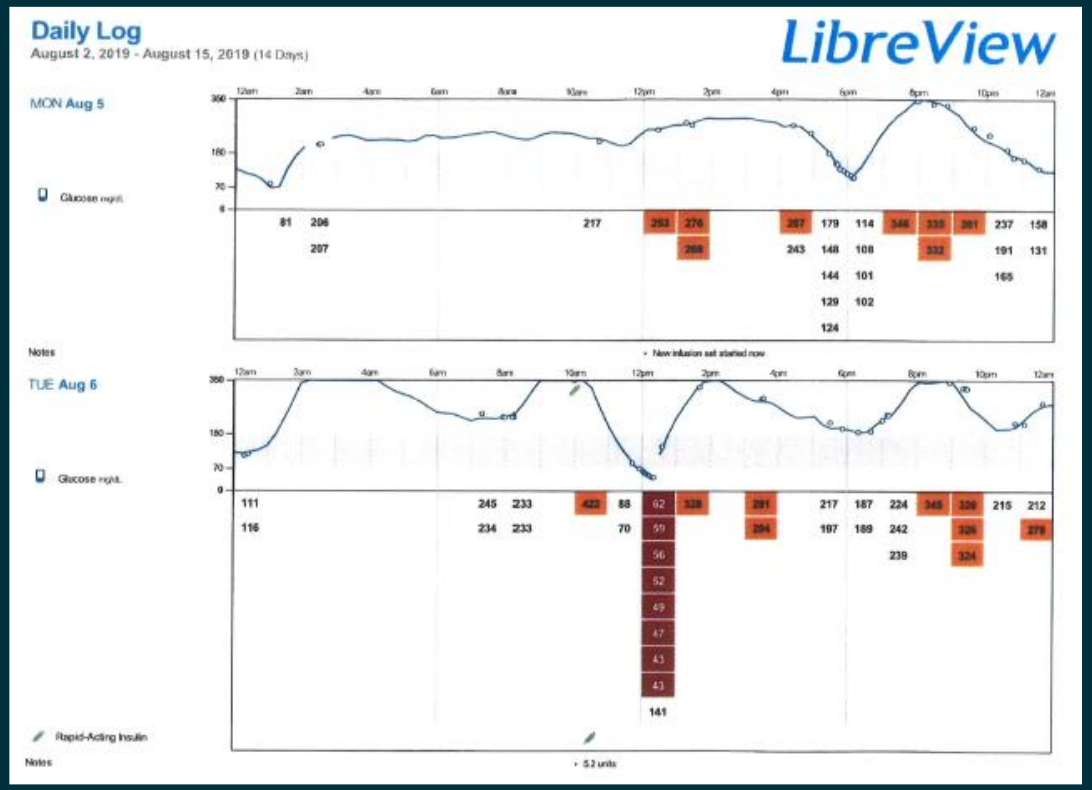
Freestyle Libre



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Medtronic Guardian 3

- Requires at least 2 finger stick calibrations daily
- Lasts up to 7 days of wear
- Alerts to hypo & hyperglycemia
- Shareable data
- Smartphone compatibility
- Acetaminophen use can affect readings
- iOS and Android
- SUGAR.IQ diabetes assistant app [8]

Professional CGM

- Blinded or unblinded
- Covered by insurance (may need a prior-auth)
- Can choose to have interpretation done by endocrinology
- Helps detect trends in type 1 and type 2 diabetes, especially overnight trends and postprandial
- Investigate hypoglycemia

Medtronic Guardian 3

- MARD 8.79% (arm) or 9.84% (3-4 calibrations/day)
- MARD 9.14% (arm) or 10.46% (2 calibrations/day)

[8]

Insurance Coverage

- Can be costly
- Medicare requires 3 times daily injections
- Medicaid covers for type 1 or pregnancy
- Commercial insurance coverage varies
- Other supporting data (hypoglycemia, third party intervention, ect.)

Settings Recommendations

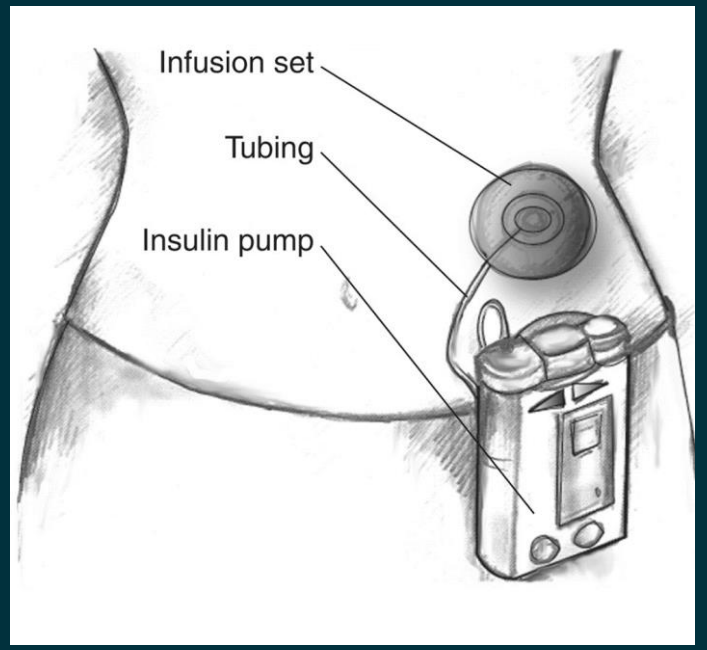
- Patient should choose alerts that will help them the most, but not be burdensome
- Low alert usually set at 70, repeat at 15 minutes
- High alert can start at 250, repeat at 1 hour

CGM programs to download data

- Programs vary, depending on device
- If cell phone compatible, easy to get reports
- Medtronic: Carelink
- Dexcom: Clarity
- Libre: LibreView

Insulin Pump Therapy

- Small device that administers insulin via small cannula in the sub-q tissue
  - Insulin stored in reservoir or pod
  - Cannula inserted via needle that is then removed
  - Infusion set or pods changed every 2-3 days



Insulin Pump Therapy

- Uses rapid-acting insulin
- Pump contains pre-set basal rates, carb ratios, insulin sensitivity factor, glucose target, & active insulin time
  - Basal rates deliver small amount of rapid-acting insulin every hour to replace need for long-acting insulin
  - Carb ratio determines how many units of insulin are needed for amount of carbs eaten
  - Insulin sensitivity = how many mg/dL 1 unit of insulin drops blood glucose to get to glucose target
  - Active insulin time = how long insulin stays active in body once administered

Benefits of Insulin Pump Therapy

- Minimizes number of injections
- Can allow for more precise delivery of insulin
- Can temporarily adjust or suspend insulin delivery
  - Helpful for exercise or change in activity
- Possibility of integrating with CGM
- Detailed reports

Drawbacks of Insulin Pump Therapy

- Skin infections
- Risk of DKA from pump malfunction or absorption issues
- Cost
- Feeling of being attached to a device

Ideal Patients for Pump Therapy

- Able to carb count
- Check blood glucose 4x/day or use a CGM
- Type 1 and type 2 diabetics
- Thorough understanding of disease state
- Pregnancy and requiring insulin

Medtronic 770G

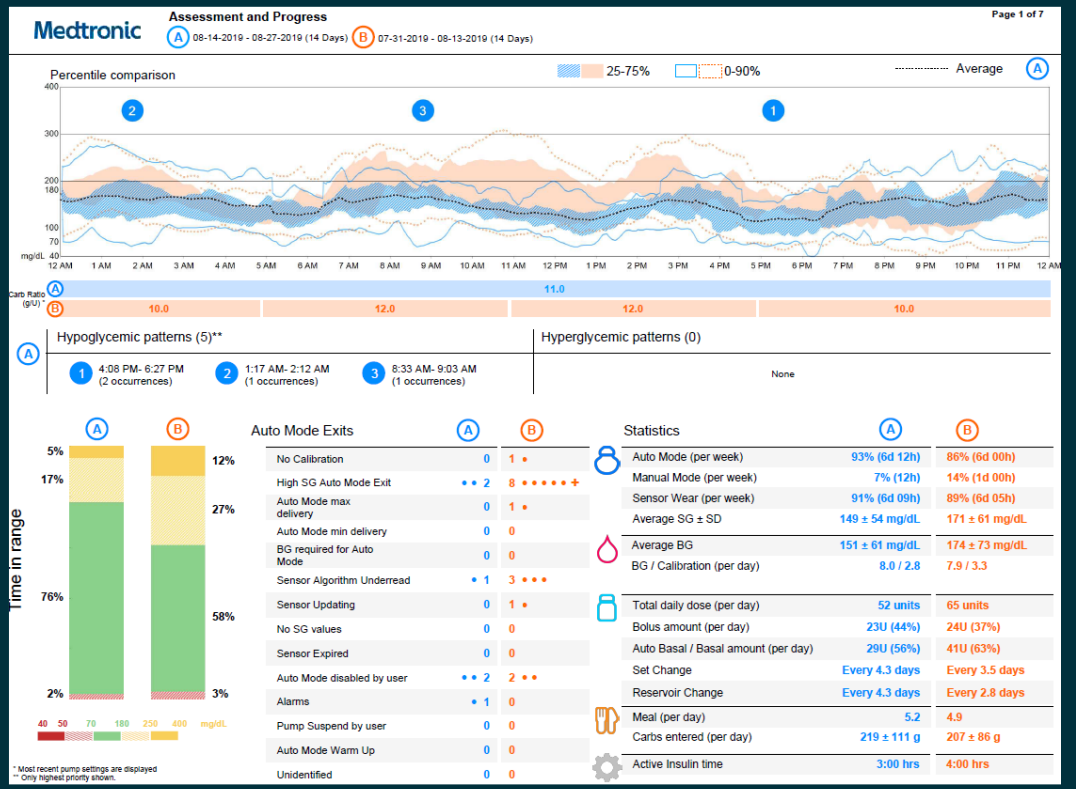
- SmartGuard™ tech. Increases or decreases insulin delivery, every five minutes per the CGM readings
  - Can predict hypoglycemia and hyperglycemia in advance.

- Bluetooth connectivity allows for automatic upload of data to Carelink [9]

Medtronic 770G

[9]

Auto Mode



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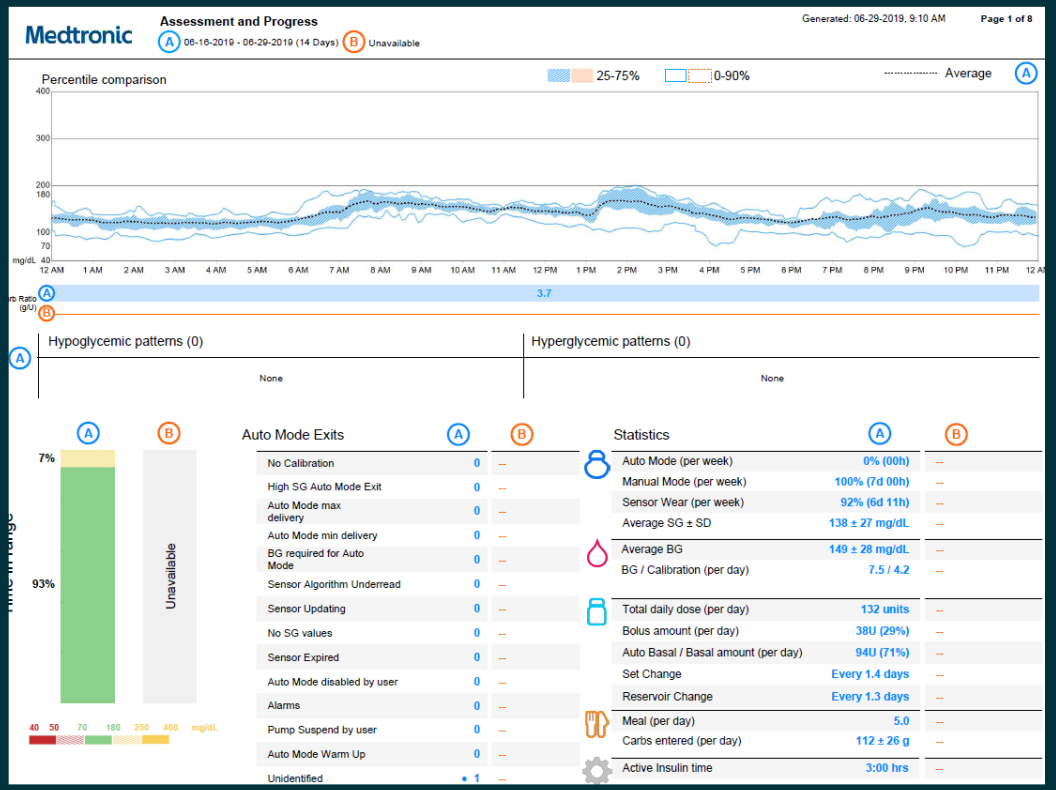
Auto Mode



Medtronic

Assessment and Progress

A 06-16-2019 - 06-29-2019 (14 Days) B Unavailable

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Page 1 of 8

Percentile comparison

25-75% 0-90% Average A

400 300 200 180 100 70 40 mg/dL

12 AM 1 AM 2 AM 3 AM 4 AM 5 AM 6 AM 7 AM 8 AM 9 AM 10 AM 11 AM 12 PM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM 11 PM 12 AM

rb Ratio (g/U) A 3.7 B

Hypoglycemic patterns (0)

None

Hyperglycemic patterns (0)

None

Time in Range

A B

7%

93%

Unavailable

40 50 70 180 250 400 mg/dL

Auto Mode Exits	A	B
No Calibration	0	--
High SG Auto Mode Exit	0	--
Auto Mode max delivery	0	--
Auto Mode min delivery	0	--
BG required for Auto Mode	0	--
Sensor Algorithm Underread	0	--
Sensor Updating	0	--
No SG values	0	--
Sensor Expired	0	--
Auto Mode disabled by user	0	--
Alarms	0	--
Pump Suspend by user	0	--
Auto Mode Warm Up	0	--
Unidentified	• 1	--

Statistics	A	B
Auto Mode (per week)	0% (00h)	--
Manual Mode (per week)	100% (7d 00h)	--
Sensor Wear (per week)	92% (6d 11h)	--
Average SG ± SD	138 ± 27 mg/dL	--
Average BG	149 ± 28 mg/dL	--
BG / Calibration (per day)	7.5 / 4.2	--
Total daily dose (per day)	132 units	--
Bolus amount (per day)	38U (29%)	--
Auto Basal / Basal amount (per day)	94U (71%)	--
Set Change	Every 1.4 days	--
Reservoir Change	Every 1.3 days	--
Meal (per day)	5.0	--
Carbs entered (per day)	112 ± 26 g	--
Active Insulin time	3:00 hrs	--

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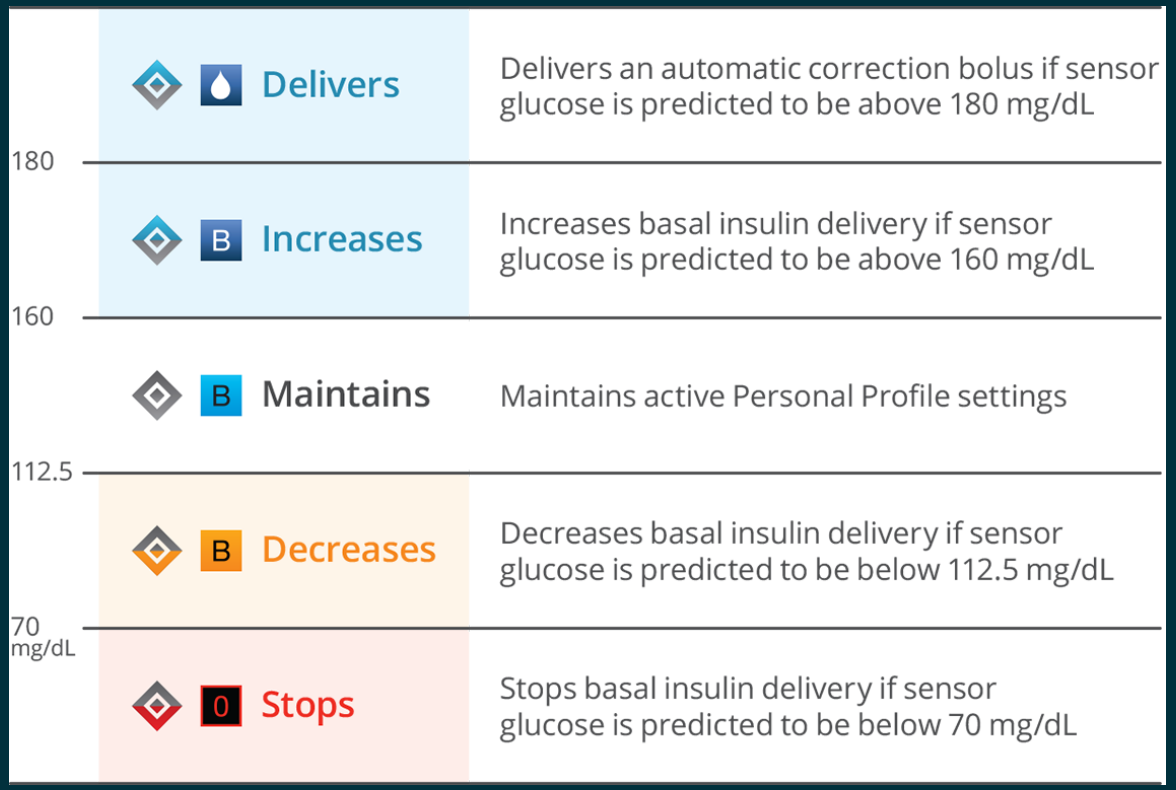
Tandem T-slim

- Color touchscreen
- Able to update via software download
- Charges via micro USB port
- Integrated with Dexcom G6 with data displayed on pump screen
- T-connect app allows for daily data upload and monitoring[10]

Tandem T-slim



[10]

Tandem T-slim

t:slim X2™
Insulin Pump

[10]

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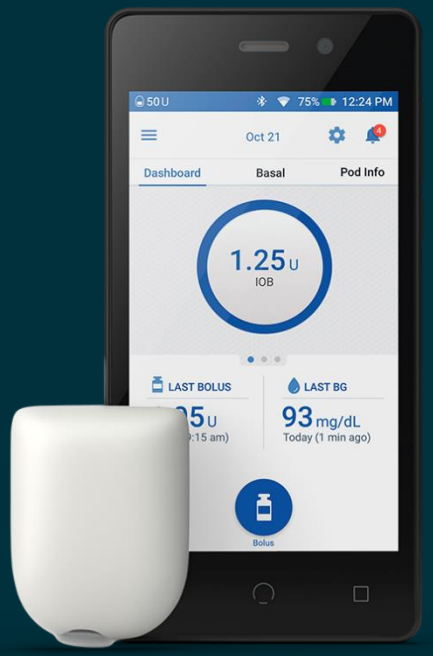
Omnipod

- Tubeless pump
  - Delivers insulin via pod instead of infusion set
  - Pod changed at least every 3 days
  - Good for very active people
- Use PDM to manage settings & deliver boluses
  - New DASH system is touchscreen
- No CGM integration at this time, but studies ongoing
- Some smartphone integration with compatible devices

[11]

Omnipod


50 U
75%
12:24 PM
Oct 21
Dashboard
Basal
Pod Info
1.25 U
IOB
LAST BOLUS
LAST BG
93 mg/dL
Today (1 min ago)
Bolus

[11]

Insurance Coverage

- Some insurances require meeting with a diabetes educator
- Type 1 diabetics covered well (cost varies)
- Type 2 diabetes if on MDI
- Medicare:
  - Generally does not cover type 2 diabetics
  - Requires fasting c-peptide & glucose
  - Requires office visit every 3 months

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