

Diabetes Technology: Use, options and interpretation

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4/24/21

Disclosures

- Advisory board for Eli Lilly

Objectives

- Insulin pumps
 - Indications
 - Available options
- Smart pens
- Continuous glucose monitors
 - Indications
 - Options
 - Downloading
 - Interpretation

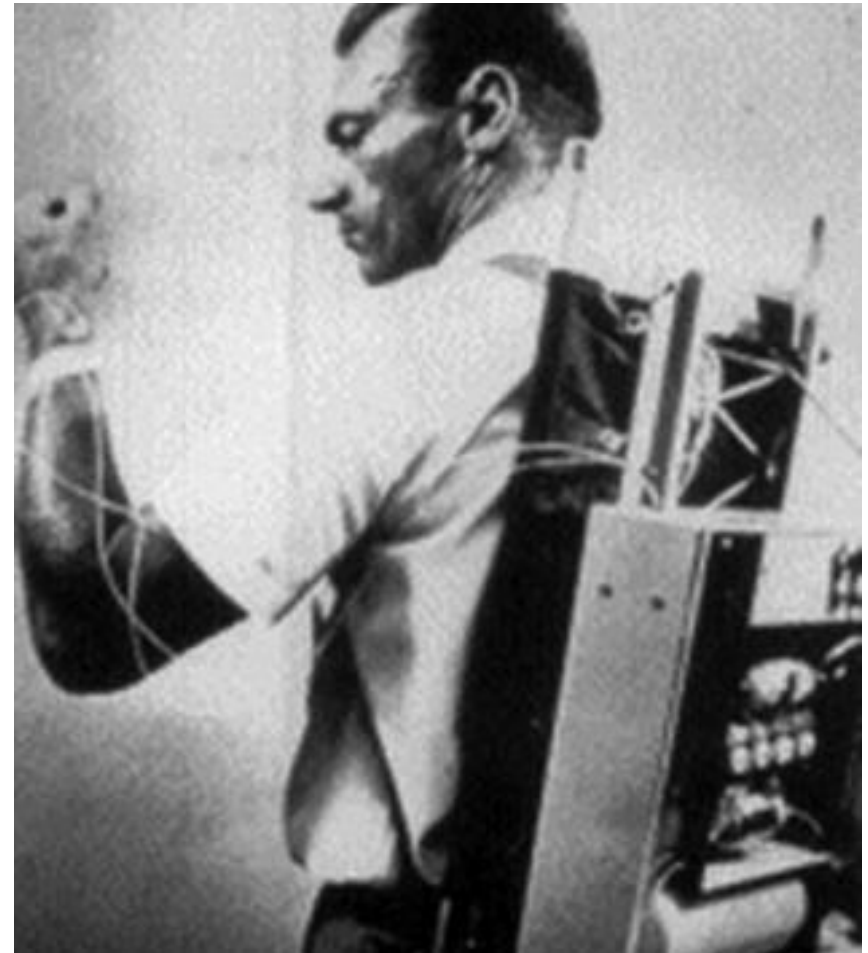
Challenges with diabetes technology

- Not “one size fits all”
- Changing quickly
- Time to download and interpret
- Insurance coverage often lags behind and even with coverage cost can be limiting

INSULIN DELIVERY

Insulin pump therapy

- Portable device that continuously delivers rapid or short acting insulin via a catheter placed under the skin
- Doses given on demand for meals and/or correction of hyperglycemia
- Site changed every 2-3 days



Pump Settings

- Carb ratio
- Basal rate
 - Can vary throughout the day and have multiple profiles
 - Temporary basal settings
- Insulin sensitivity factor (ISF)
 - Correction factor based on amount of glucose reduction (mg/dL) expected from 1 unit of insulin to a specified target
- Insulin active time
 - Duration of insulin activity

Advantages of Insulin Pumps

- Ability to delivery very small doses with efficient absorption
- Variable basal and prandial infusion rates
 - Prandial features- extended boluses, reminders
 - Basal features- different profiles, variable rates, temporary basal settings
- Bolus wizard calculators
- Insulin on board features
- Fewer injections
- Ability to download pump data to computer
- Integration with CGM

Indications for insulin pump therapy

ADA Standards of Care 2021

- All adults and youth with type 1 diabetes who can safely manage device
- Considered as option for adults and youth with type 2 diabetes as well as other forms of DM requiring multiple daily injections who can safely manage device

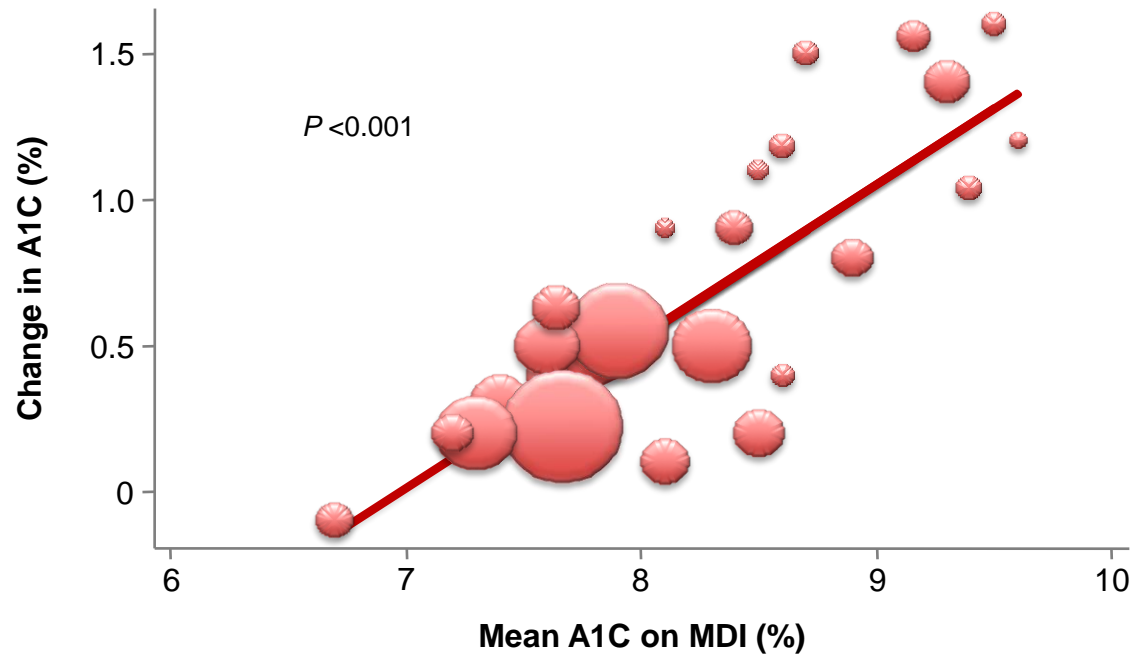
Insulin pump therapy vs MDI

No large scale trials

Meta-analyses with reduction in A1c 0.3-0.6% and reduction in rates of severe hypoglycemia

Largest benefit in those with highest baseline A1c

Studies do show benefit in QoL



Pickup JC, Sutton AJ. *Diabet Med.* 2008;25:765-774.
Misso ML, et al. *Cochrane Database Syst Rev.* 2010:CD005103.
Yeh HC, et al. *Ann Intern Med.* 2012;157:336-347.

Pumps with canula

Tandem TSlim



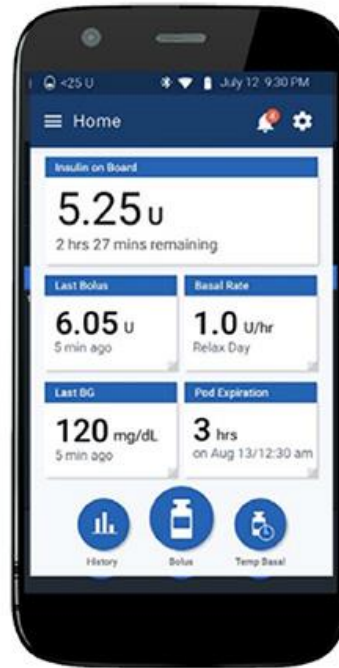
Medtronic (670G)



Tubeless pump- Omnipod



Current PDM



DASH PDM



Insurance Coverage

- Benefits typically through durable medical equipment (DME) however some insurances now covering OmniPod through pharmacy benefits
 - This includes Medicare
- Majority of patients with type 1 diabetes will have coverage although may be only certain brands
- Type 2 is more difficult to get covered unless there is pharmacy coverage

CMS Requirements

- C-peptide level <10% lower limit of normal OR beta cell autoantibody positive
- Completed a comprehensive diabetes education program
- 3 or more insulin injections daily
- 4 or more SMBG daily

One or more of the following

- A1c >7%
- Recurrent hypoglycemia
- Wide glucose fluctuations before meals
- Dawn phenomenon
- History of severe glycemic excursions

VGo-Patch pump

- For type 2 DM, replaced daily
- Some manual dexterity required
- Set basal rates of 20, 30, or 40 units
- Patients do clicks for bolus insulin
 - 1 click = 2 units of insulin

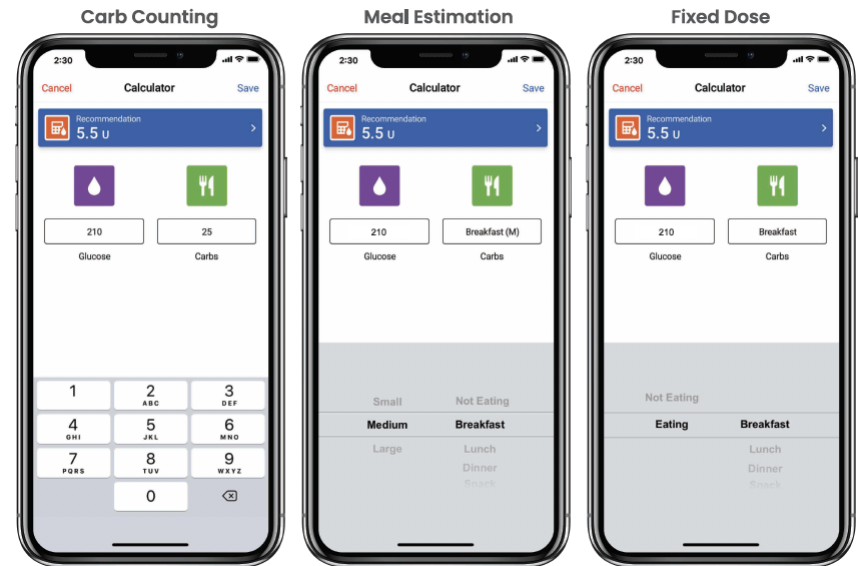


Smart Insulin Pens

- Initially smart caps that recorded insulin dosing data and communicated with apps or mobile platform
- This has progressed to Bluetooth-enabled pens which track data and communicate with an app as well as CGM systems
- More options currently being developed and some with closed loop technology which will adjust insulin doses

InPen

- Currently only smart pen with FDA approval
- Only used with mealtime insulin
 - Novolog/fiasp
 - Humalog
- Communicates with app which integrates with CGM data and generates report
- Provides many features of a pump without cost or having device attached



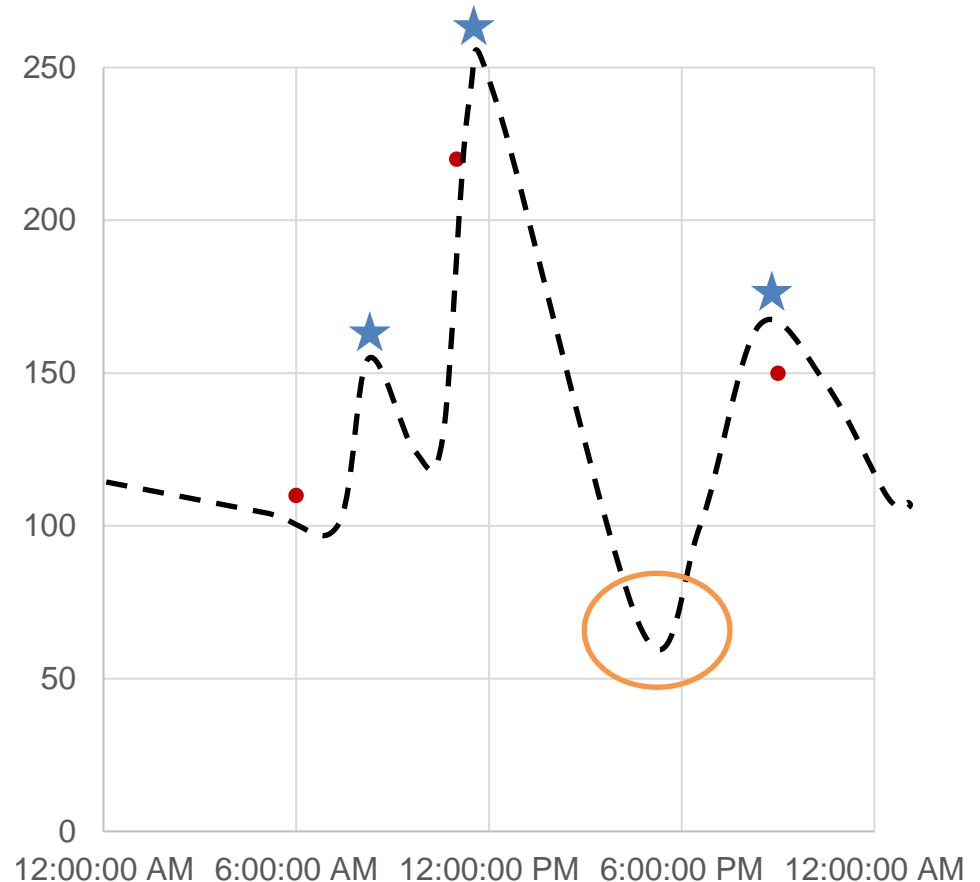
CONTINUOUS GLUCOSE MONITORS

Continuous Glucose Monitors (CGM)

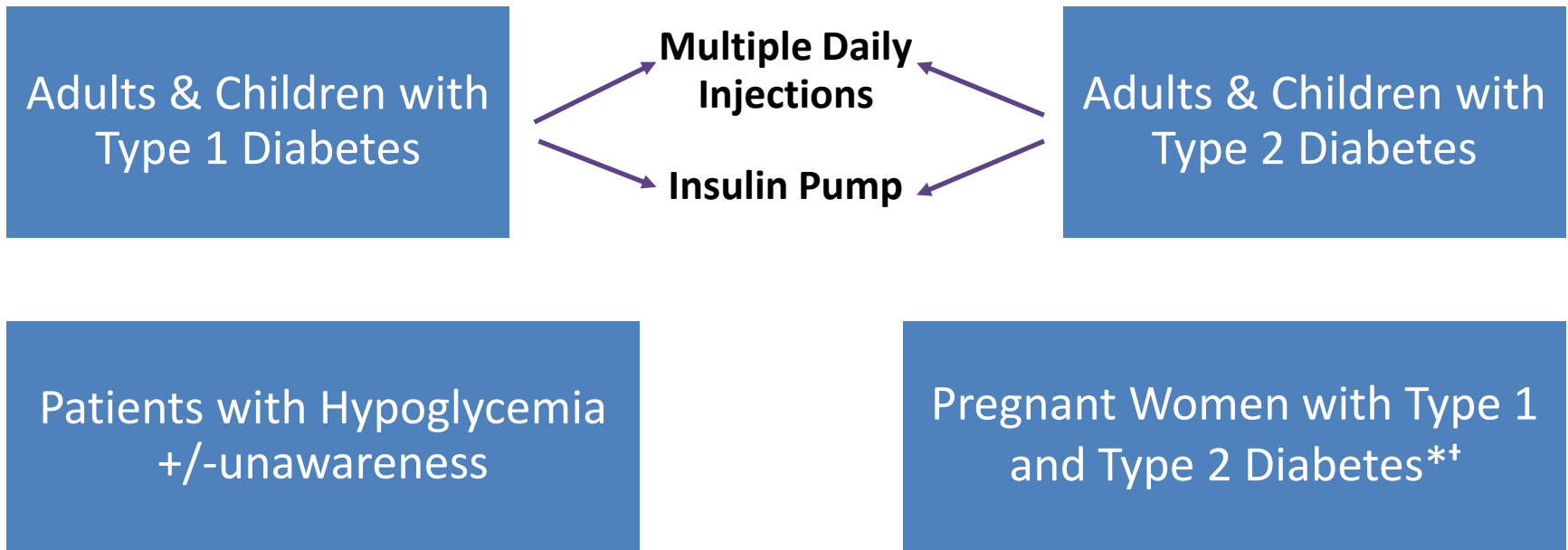
Measure glucose in interstitial fluid and send to receiving device, smartphone, insulin pump etc.

Benefits of CGM

- Reduction of time spent in hypoglycemia
- Reduction of time spent in hyperglycemia/improved A1c
- Improved quality of life and flexibility



Who Should Use CGM?



*On intensive insulin therapy

†Not currently approved by the FDA for routine use in pregnancy

Types of CGM

Real Time CGM (rtCGM)	Measure and display glucose readings continuously	Options: <ul style="list-style-type: none">• Dexcom G6• Eversense• Medtronic Enlite and Guardian
Intermittently scanned CGM (isCGM)	Measure glucose levels continuously but only show readings when swiped by a reader or compatible smartphone	Options: <ul style="list-style-type: none">• FreeStyle Libre2• FreeStyle 14 day sensor

Dexcom G6

- RtCGM which can communicate with receiver, smartphone, smartwatch, insulin pump
- Transmitter used for 90 days and sensor replaced every 10 days
- Customizable alerts for low/high glucose as well as rate of change
- Glucose can be followed by up to 5 other people via app
- Approved for use on abdomen but many patients wear on arms



FreeStyle Libre

Libre2

- Optional alarms for hypo- and hyperglycemia
- Still requires patient to scan at least every 8 hours
- Currently only compatible with receiver but app waiting for approval
- Approved for use on upper arm

14 day sensor

- First generation device
- isCGM without alarms
- Compatible with receiver or smartphone
- Approved on upper arm



When I chose each device

Dexcom

- Type 1 diabetes or someone with hypoglycemia unawareness
- Use of insulin pump with closed loop system
- Family member/friend would like to follow

FreeStyle Libre

- More often for type 2
- When cost is limiting factor
 - Often available through pharmacy which is easier for office staff and patients
- Alarm fatigue

Insurance coverage

- Coverage varies greatly by insurance. Can be covered through pharmacy or DME
- Generally covered for people with T1DM (although cost may still limit access), often covered for patients with type 2 on MDI. Medicare will cover for patients on MDI who check glucose 4 times daily
- Sometimes covered for type 2 not on insulin
- Usually start with pharmacy and if not covered send to DME
- Coverage is improving and changing quickly

Education and appropriate device use

- Always refer to diabetes education when starting a new CGM

“When prescribing continuous glucose monitoring (CGM) devices, robust diabetes education, training, and support are required for optimal CGM device implementation and ongoing use.” ADA SOC 2021

- All patients should also have and know how to use glucometer

CGM DOWNLOADING AND INTERPRETATION

Getting CGM Data

- Can be time consuming but huge benefit of these tools
- Receiver for either device needs to be physically connected to computer to download
- Patients who use their phones as receiver can link their personal accounts to a clinic account and data will be automatically transmitted and can be viewed by provider at any time

LibreView- www.libreview.com

- Provider/provider's office and patient both need accounts which need to be linked
- Data from app available continuously, data from receiver appears anytime downloaded (either at home or office)
- Can link accounts in two ways
 1. Provider can send email invitation to patient
 2. Provider can share practice ID with patient and then accept request when patient enters ID in their account

LibreView Patients Professionals Sign Up

One System | Consistent Reports | Easy Sharing

LibreView is a secure, cloud-based diabetes management system that gives healthcare professionals and patients clear, easy-to-understand reports from compatible FreeStyle glucose monitoring devices.

Member Login

Email Address

Password

Log In

Forgot Password

Sign Up

Dexcom Clarity- clarity.Dexcom.com

- Data can be shared in two ways
 1. Provider and patient accounts can be created and linked via email invitation initiated by provider
 - ⦿ Must do this for patients with receiver
 2. Patient can generate “share code” in their app and share with provider
 - ⦿ Works only if patient using app
 - ⦿ Code can be good for 3, 6 or 12 months so needs to be updated

Login with your Dexcom CLARITY Healthcare Professional &

Username

[Forgot your username?](#)

Password

[Forgot your password?](#)

Login

View data shared from a smart device

If your patient has the [Dexcom CLARITY app](#) on their smart device, they can generate a data-sharing code so you can view their data on your schedule.

Enter patient provided sharing code

????-????-????

[View Reports](#)

Need to register your clinic? [Register Now](#)

CGM Interpretation: Metrics

Glucose

Average Glucose

167 mg/dL

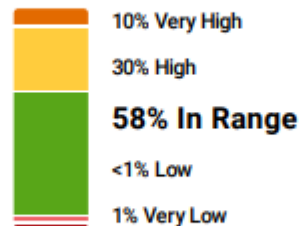
Standard Deviation

59 mg/dL

GMI

7.3%

Time in Range



Target Range:
70-180 mg/dL

Sensor Usage

Days with CGM data

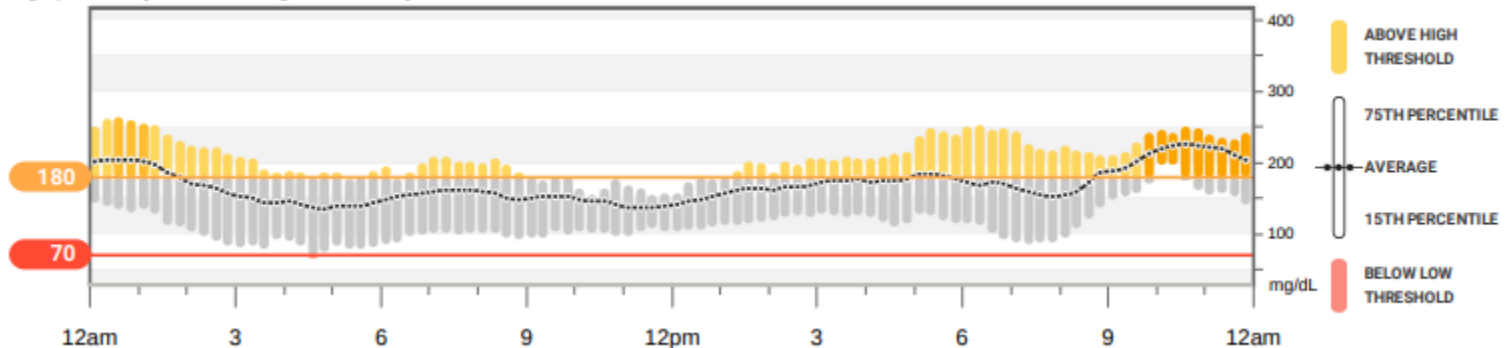
100%

14/14

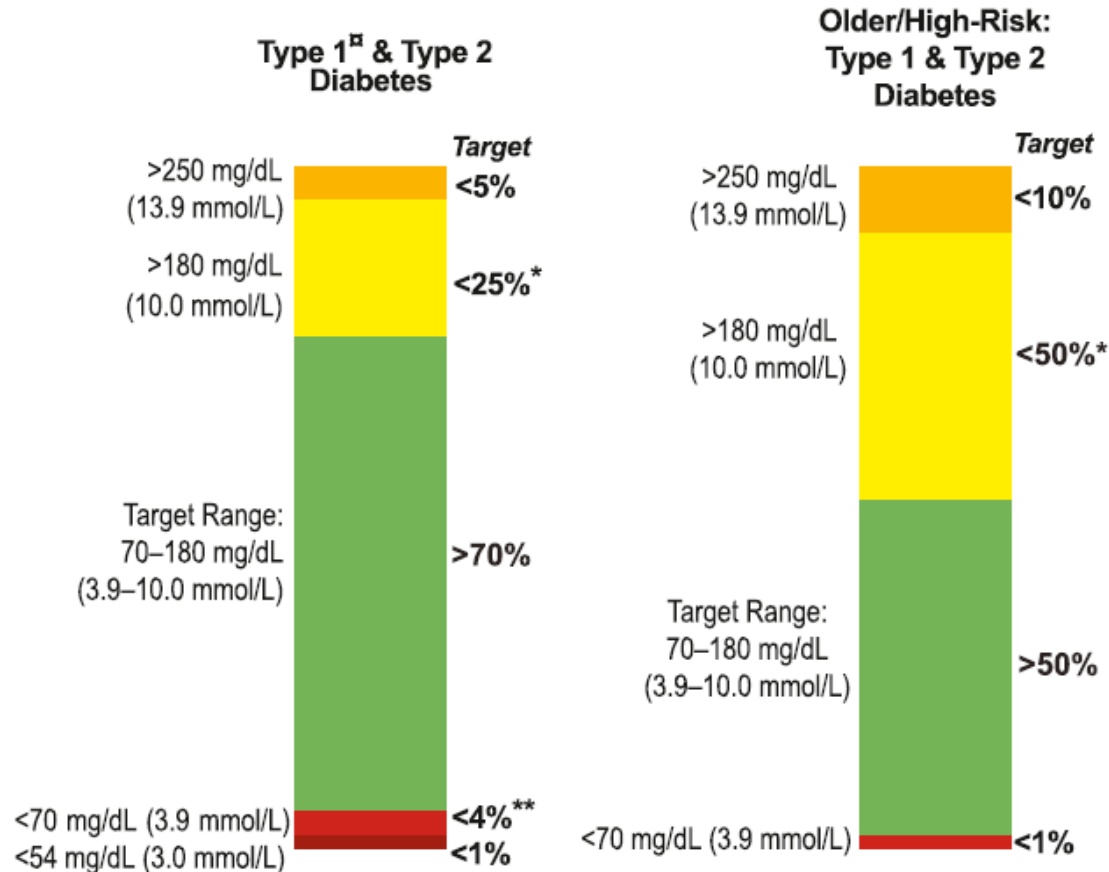
Avg. calibrations per day

0.0

This graph shows your data averaged over 14 days



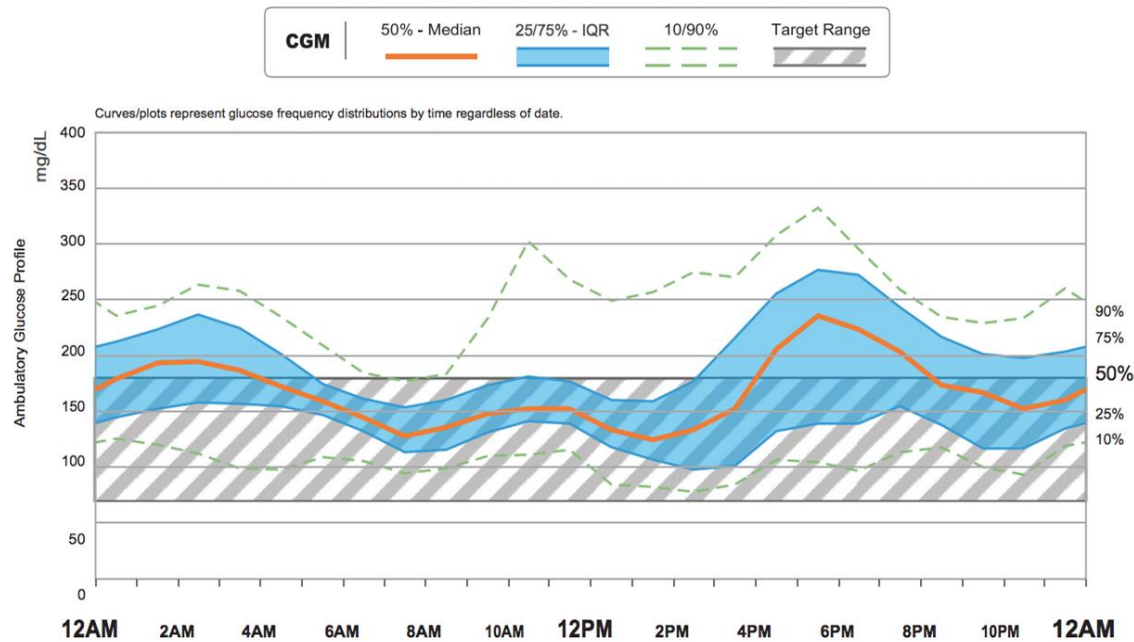
CGM Interpretation: Time in Range



CGM Interpretation: Ambulatory Glucose Profile

Where are the challenges?

Defined by the **AGP Graph**



Orange line: median glucose Blue ribbon: 25-75% percentile Shaded region: target range

KEY POINT:

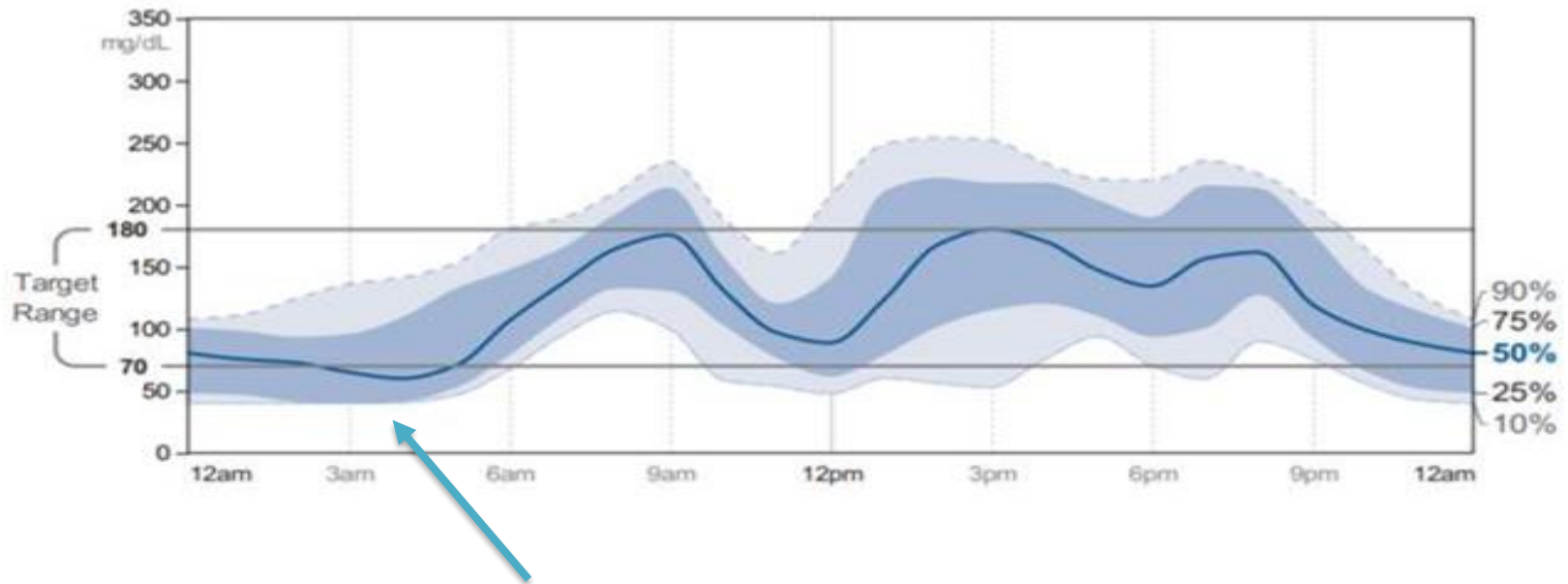
Look at AGP Graph before Daily Views

Fasting Trends

Dose: Excess Basal Insulin

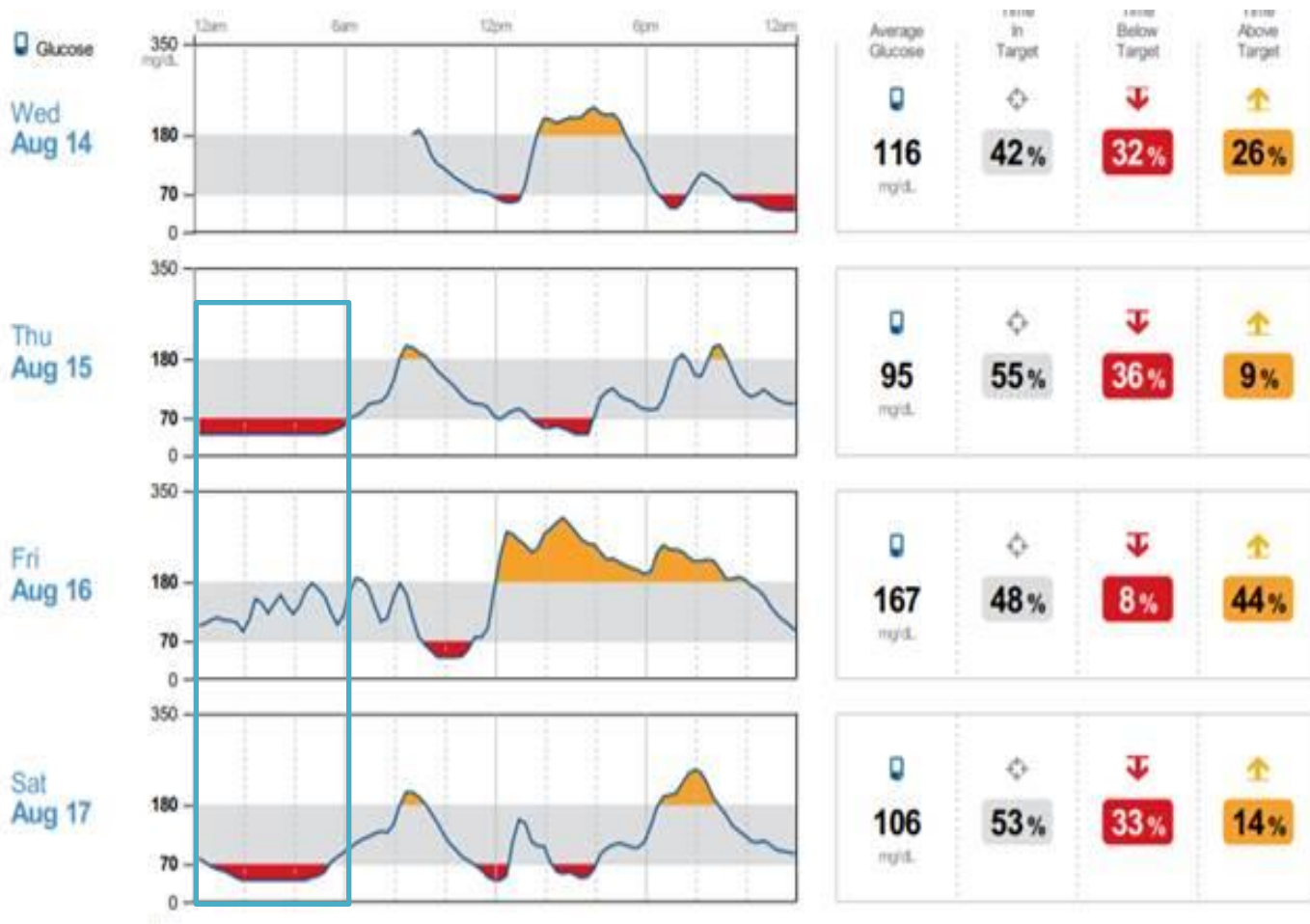
Ambulatory Glucose Profile

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



Fasting Trends

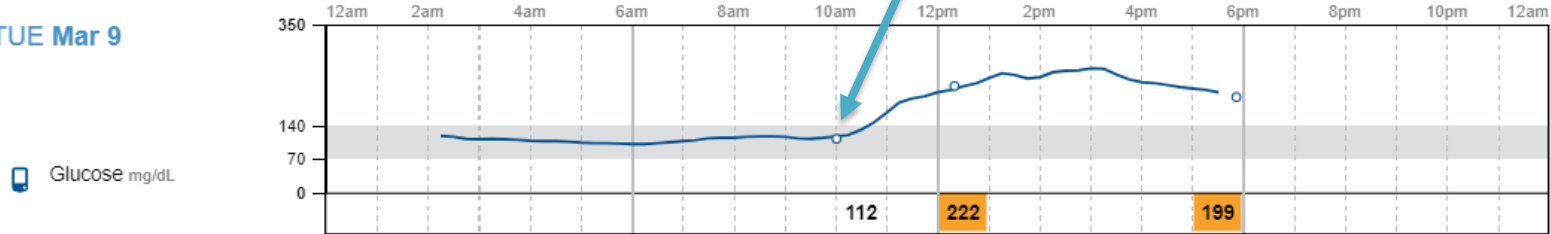
Dose: Excess Basal Insulin



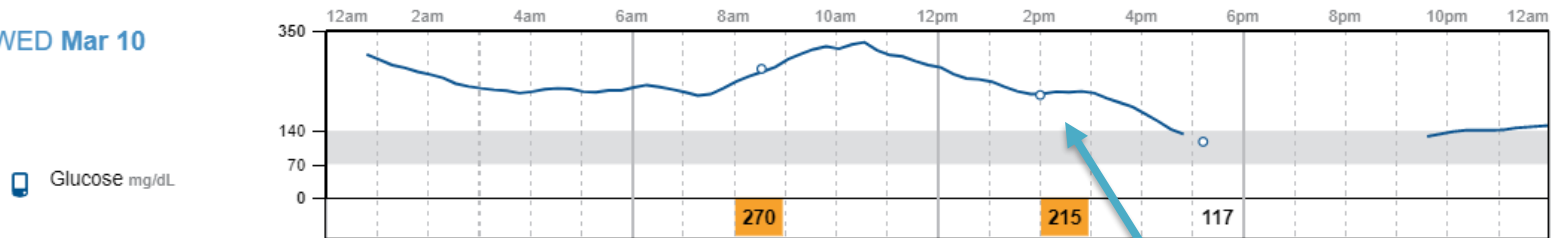
Postprandial Trends

Missed or insufficient insulin
Not enough scanning of sensor!

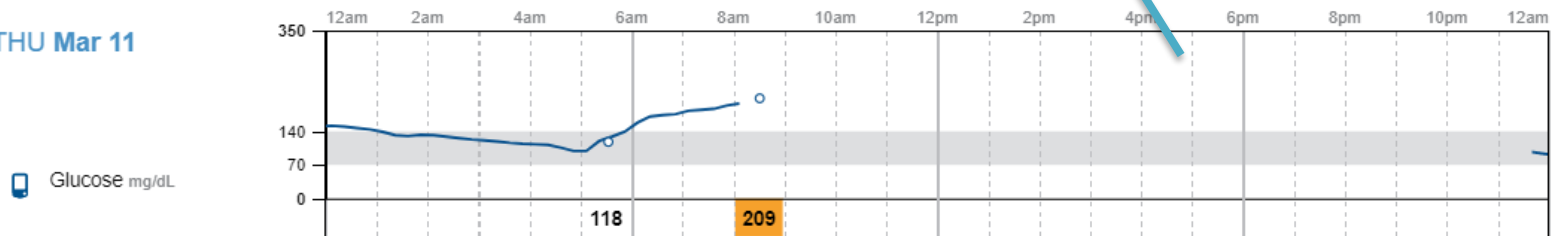
TUE Mar 9



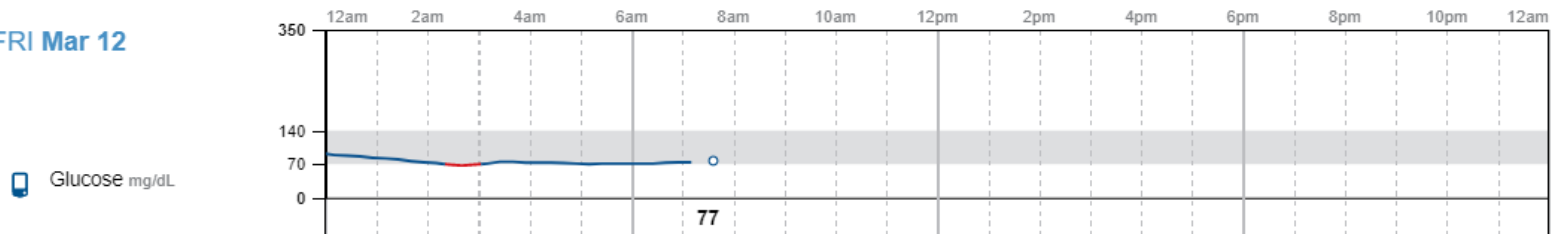
WED Mar 10



THU Mar 11



FRI Mar 12



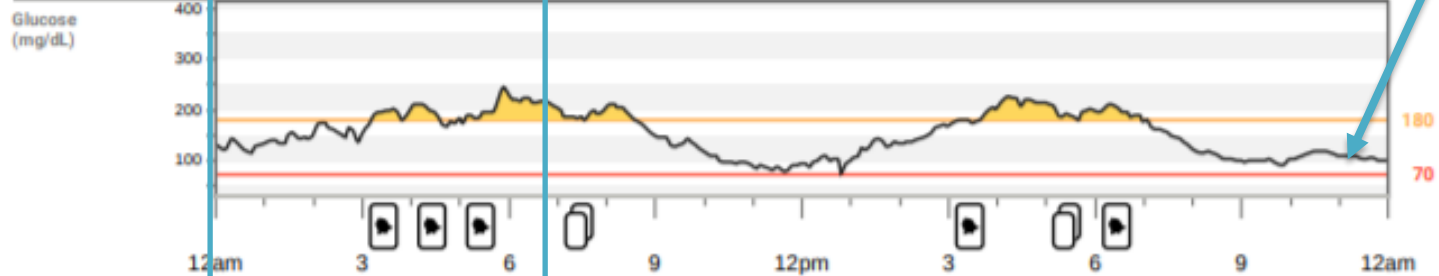
Fasting Trends

Dose: Inadequate Basal Insulin

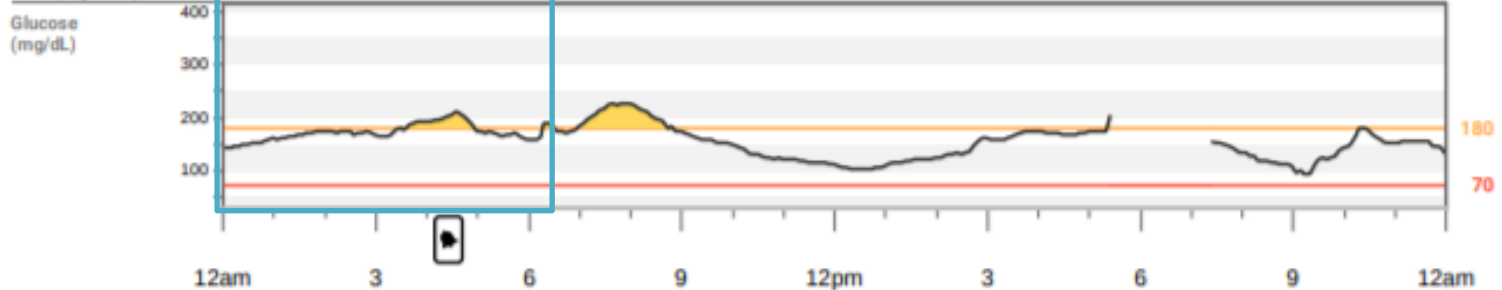
Wed, Apr 21, 2021



Tue, Apr 20, 2021



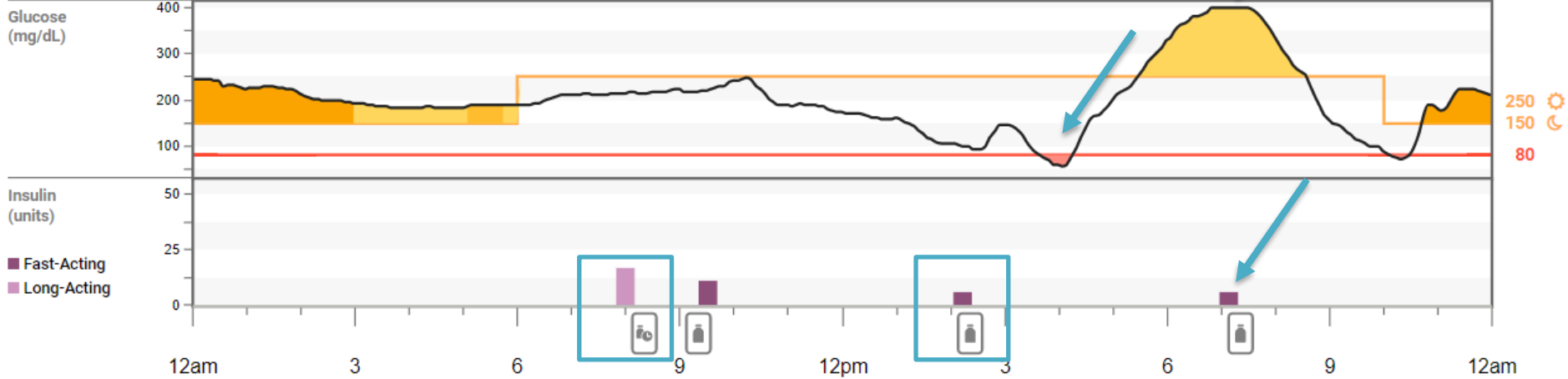
Mon, Apr 19, 2021



Post-Prandial Trends

Timing: Missed & Delayed Prandial Insulin

Sun, Apr 18, 2021

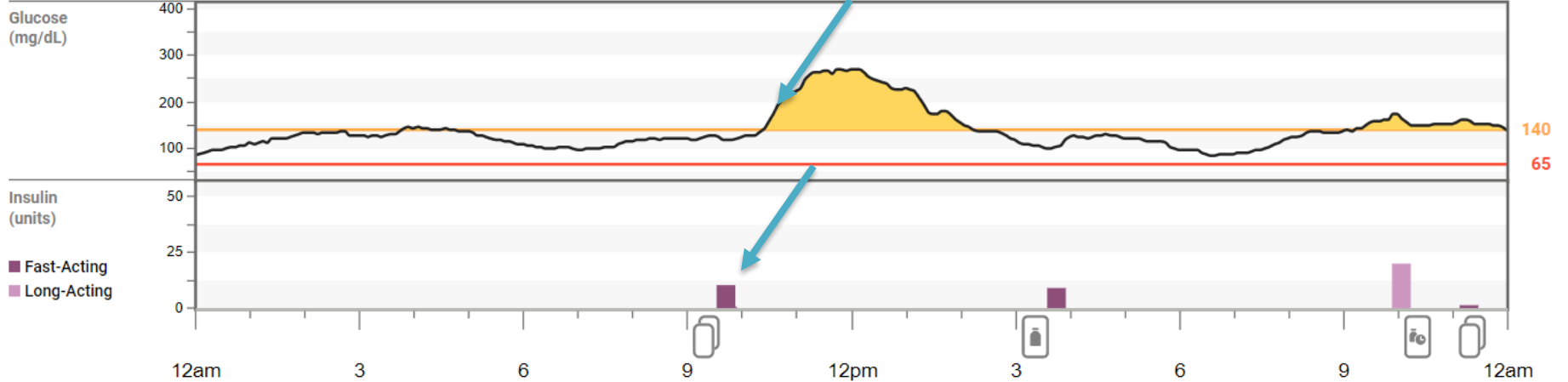


🕒 8:00 AM [Pen] Long-Acting 17.0 units	🕒 9:31 AM [Pen] Fast-Acting 11.0 units	🕒 2:13 PM [Pen] Fast-Acting 6.0 units	🕒 3:34 PM Low
🕒 3:49 PM Urgent Low Soon	🕒 4:03 PM Urgent Low	🕒 5:49 PM High	🕒 7:08 PM [Pen] Fast-Acting 6.0 units
🕒 7:28 PM [Pen] Fast-Acting 0.5 units (prime)	🕒 7:28 PM [Pen] Fast-Acting 28.0 units (prime)	🕒 9:59 PM Low	🕒 10:24 PM Low

Post-Prandial Trends

Dose: Insufficient Prandial Insulin

Wed, Apr 14, 2021



<p>🕒 9:42 AM [Pen] Fast-Acting 10.5 units</p>	<p>🕒 9:42 AM [Pen] Fast-Acting 0.5 units</p>	<p>📈 10:34 AM High</p>	<p>🕒 3:44 PM [Pen] Fast-Acting 9.0 units</p>
<p>📈 9:44 PM High</p>	<p>🕒 10:02 PM [Pen] Long-Acting 20.0 units</p>	<p>📈 11:09 PM High</p>	<p>🕒 11:17 PM [Pen] Fast-Acting 1.5 units</p>

Summary

- Many options for diabetes technology and choice is patient specific
- Can lead to improvement in glucemic control, less hypoglycemia and improved quality of life
- Diabetes education vital to appropriate use
- Can be time consuming but once systems in place can improve patient care

Thank you!