Automated Insulin Delivery Pumps

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7/8/24

Children's
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Automated Insulin Delivery Pumps

Tandem t:slim X2

Tandem Mobi

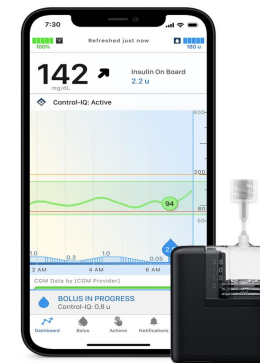Medtronic 780G

Omnipod 5

Beta Bionic iLet

Automated Options

Insulin pumps that have the automated insulin delivery option:

- **Medtronic 780G in SmartGuard Mode**
  (Guardian Connect sensor)
- **Tandem t:slim X2 with Control IQ Technology**
  (Dexcom G6, Dexcom G7, Freestyle Libre 2 Plus)
- **Tandem Mobi with Control IQ Technology**
  (Dexcom G6 or Dexcom G7)
- **Omnipod 5 in Automated Mode**
  (Dexcom G6 or Dexcom G7)
- **Beta Bionics iLet**
  (Dexcom G6 or Dexcom G7)

Websites

For more information:

- Medtronic 780G (www.medtronicdiabetes.com)

- Omnipod DASH or Omnipod 5 (www.omnipod.com)

- Tandem t:slim X2 or Mobi (www.tandemdiabetes.com)

- iLet (www.betabionics.com)

- Diabetes Resources (www.myschoolnurse.net)

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Simulator Apps

Automated insulin pumps have simulator apps for practice

Medtronic 780G: MiniMed Virtual

Omnipod 5: Omnipod 5 simulator

Tandem t:slim: T:Simulator

Tandem Mobi Simulator: main.dugvvq4v5elvs.amplifyapp.com/dashboard/

Beta Bionics iLet Simulator: Able to access from phone or computer
deploy-react-simapp.s3-website.us-east-2.amazonaws.com

Automated Insulin Pump Requirements

Automated Insulin Delivery (AID) or Hybrid closed loop insulin pumps

- Not all automated insulin pump algorithms work the same way
- Must have a CGM that can communicate with the insulin pump
- Does not "do everything" for you
- If you do not have a sensor/CGM, then the patient can still use the insulin pump, but it would not have the automated delivery option (This is not true for iLet)
- AID have the ability to use CGM readings in order to automatically adjust the basal insulin
- Most systems use previously "learned" dosing history and predicted CGM glucose values 30 to 60 minutes in the future; they will speed up, slow down, or suspend basal insulin accordingly

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Automated Insulin Pump

- Important to enter in any carbohydrates eaten

- Bolus before eating

- Best practice is to enter a glucose reading (CGM or finger stick) into the pump for bolus calculations at least 4 times per day.
  - ❖ (breakfast, lunch, dinner, and bedtime)

- Enter a glucose reading at mealtimes even if it is below or in target range. This will ensure correct calculations are completed.
  - ❖ (Reverse Correction)

- The patient still has the ability to correct the glucose every 2 hours if needed.
  - ❖ (when a glucose/CGM reading is manually entered)

- Insulin on Board/Active Insulin is still used in calculations for automated insulin pumps.

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Medtronic 780G

- Insulin pump communicates with the Medtronic Guardian sensor
- The pump may ask for a finger stick blood glucose entry to calibrate and keep the sensor accurate
- **SmartGuard Mode: (Adjustable Target 100-120)** When turned "ON" and wearing the Guardian sensor. The algorithm will increase, decrease, and suspend basal insulin to keep the glucose at the programmed target
- If worn with the sensor but not in SmartGuard, then the pump can only adjust the basal insulin to suspend before low
- Must enter in carbohydrates and still perform finger sticks

Bolus Dosing

Medtronic 780G Insulin Pump

Bolus Dosing

Omnipod 5

- Communicates with the Dexcom G6 and Dexcom G7 CGM

- **The Dexcom app will have to be on the patient's phone to use Automated Mode (Cannot use the Dexcom receiver)**

- Patient will either use the Omnipod 5 cell phone app to dose with or the controller that is sent from Omnipod (Cannot use both or trade back and forth)

- App is only available on some Android devices at this time, iOS coming soon

- Automatically uploads to Glooko via built in SIM card – do not have to use WiFi

- No tubing

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Omnipod 5

- **Manual Mode**: Uses the programmed basal rates, does not automatically adjust the rates. Does not communicate with Dexcom other than showing the reading on the screen of the pump.

- **Automated Mode: (Adjustable Target 110-150)** Automatically suspends basal insulin when glucose is predicted to be at the low level, slows down basal insulin, increases basal insulin (Must have Dexcom G6 or G7 connected to pump and Automated Mode "On" for Automated mode to function)

- User must enter in all carbohydrates eaten (for both Manual or Automated)

- **SmartBolus:** The pump will adjust the bolus amount to deliver based on the CGM glucose number and directional arrow trend (This is in both Manual or Automated if wearing Dexcom G6 or G7)

- Enter blood glucose or the CGM reading if a correction is needed

- Can correct every 2 hours if needed

Omnipod 5

Omnipod 5 Insulin Pump
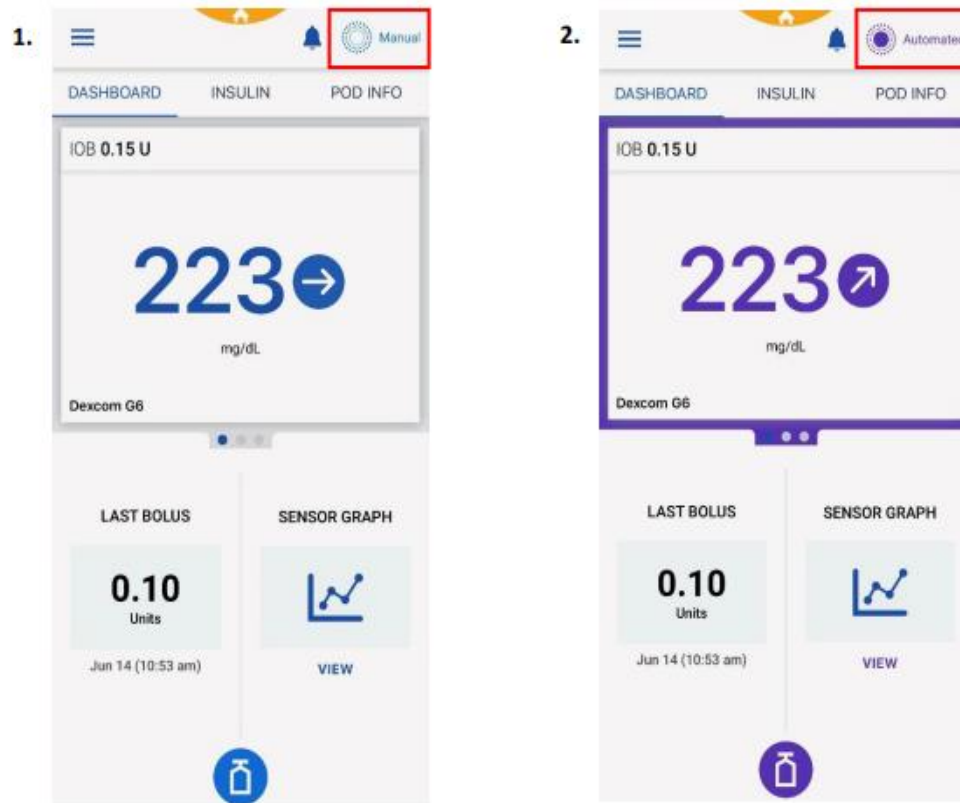
Bolus Dosing
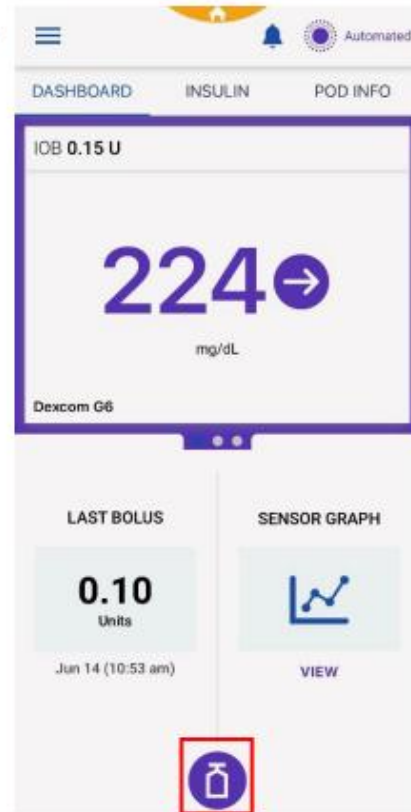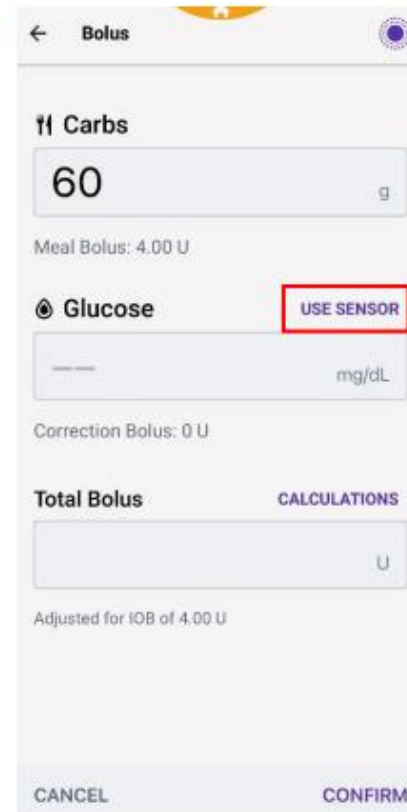
Bolus Dosing

5.

← Bolus

🍴 Carbs

60 g

Meal Bolus: 4.00 U

◉ Sensor (9:49 AM)

224 mg/dL

Correction Bolus: 2.00 U

Total Bolus CALCULATIONS

6 U

Adjusted for IOB of 6.00 U

CANCEL CONFIRM

6.

← Confirm Bolus

🍴 Carbs 60 g
◉ Sensor (11:12 AM) **224** mg/dL

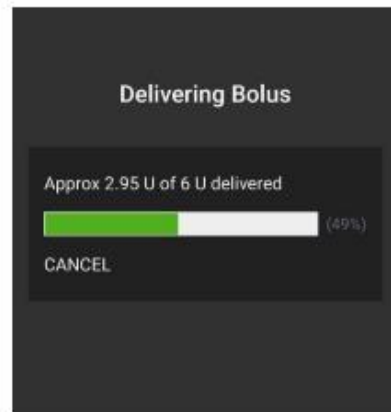**Total Bolus** **6** U
CALCULATIONS Adjusted for IOB of 1 U

START

CANCEL

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Bolus Dosing
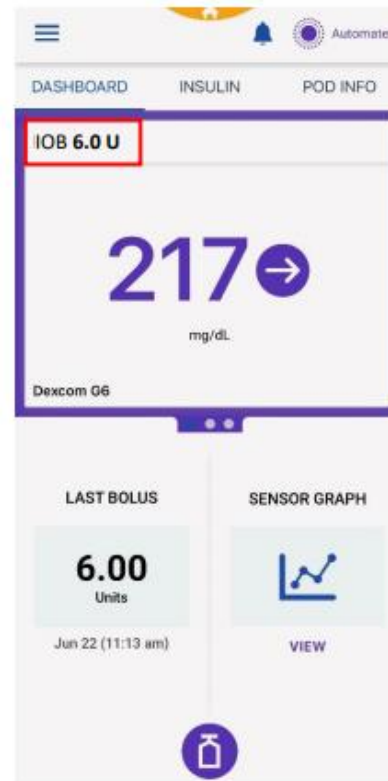
Automated Delivery Restriction

- **Important:** The Controller might give an alert to change to Manual mode and check a finger stick blood glucose, then switch back to Automated Mode in 5 minutes. This is to ensure the Dexcom is reading properly

- If they do not read the screen when they get this warning, it will place them in Manual Mode automatically
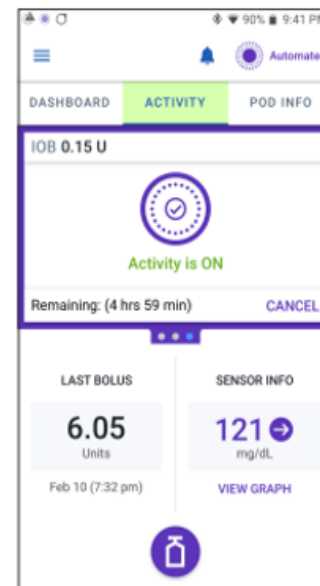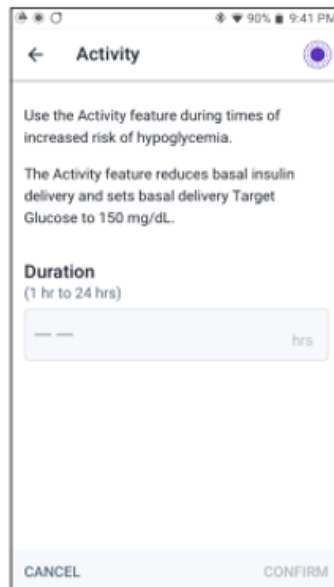
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Automated Delivery Restriction
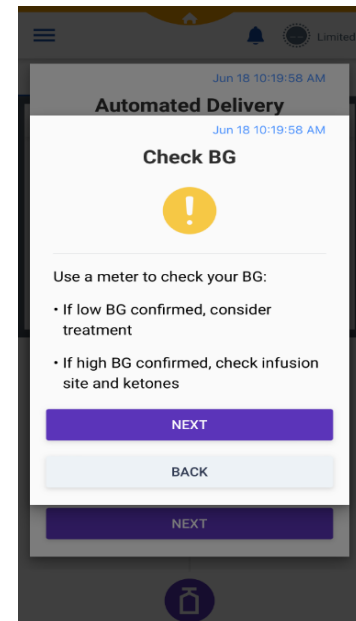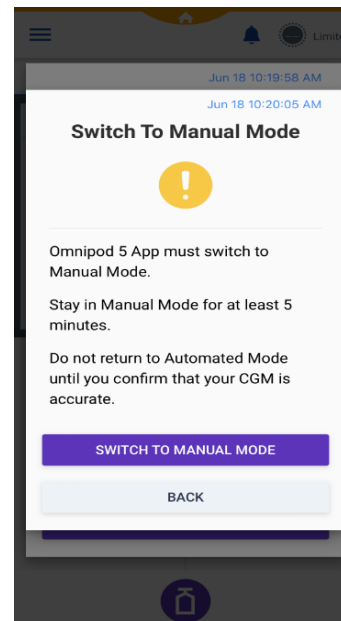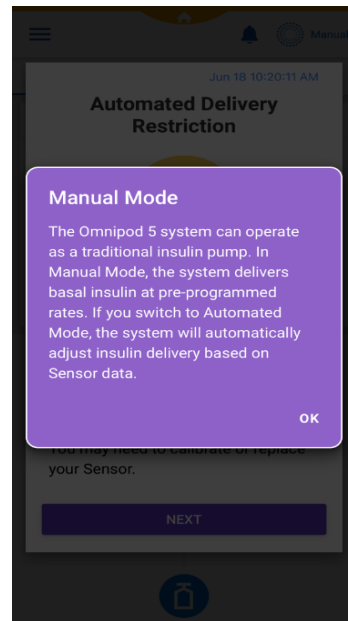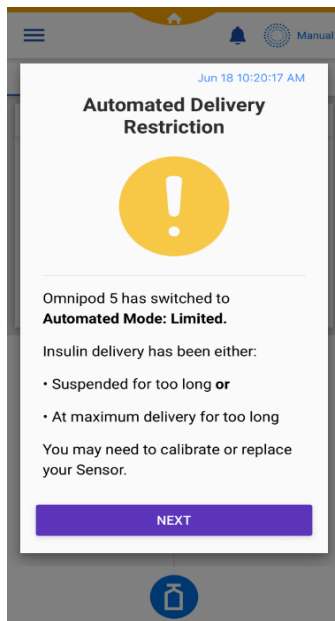
Omnipod 5 Activity Feature

- Tap "Activity" in the menu screen to turn on and set a time limit
- After the time limit has been reached it will no longer be in Activity
- This temporarily adjusts the Target to 150mg/dL
- It tells the pump to be more cautious with delivery to help prevent hypoglycemia with activity

Tandem t:slim X2

- Communicates with the Dexcom G6, Dexcom G7, or Freestyle Libre 2 Plus CGM's
- Automatically uploads to t:connect/tandem source if phone app is paired to the insulin pump
- Remote bolus from t:connect mobile app
- Does not "kick" out of modes

Control IQ: (Target 110 -not adjustable) CGM will predict glucose levels 30 minutes in advance, the pump then suspends basal insulin when glucose predicted to be at low level, slows down basal insulin, increases basal insulin, and can give an auto correction bolus up to once every hour if needed to keep the glucose within the Target range of 112.5-160mg/dL

Exercise Mode: Target range 140-160. Suspends at 80
Sleep Mode: Target range 112.5-120, no auto corrections (Set times to automatically turn on and off)

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Bolus Dosing

Tandem t:slim Insulin Pump

Bolus Dosing
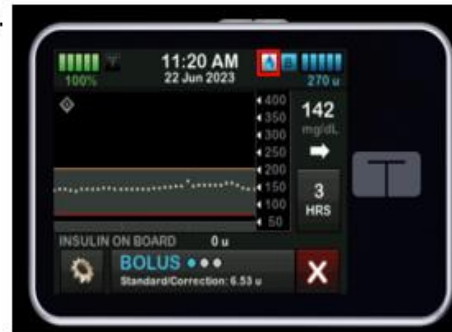
Tandem t:slim Insulin Pump

Tandem t:slim X2
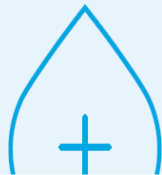
Control-IQ Technology

MG/DL T

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 technology	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

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Tandem t:slim X2 Exercise Mode

- Exercise Mode
- Tap "Activity" in the Options screen to turn on
- If they have the updated Software, then you can set a time limit
- After the time limit set it will no longer be in "Exercise Mode"
- If they do not have updated software, then tap to turn back off
- This temporarily adjusts the Target to 140mg/dL
- It tells the pump to be more cautious with delivery to help prevent hypoglycemia with activity
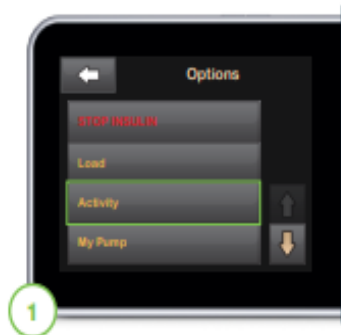
From the **Options** menu tap **Activity**.

Tap **START** next to Exercise.
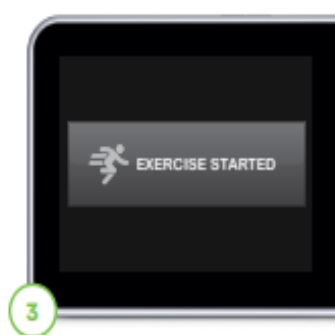
Exercise is now enabled.
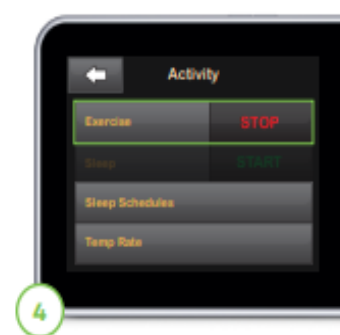
Tap **STOP** to turn Exercise off.

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Tandem t:slim X2 or Tandem Mobi

Things to know:

- If no CGM or Control IQ turned "off", then it will use the original Target and Active insulin time programmed in the settings

- Control IQ can deliver an automatic correction dose (Only 60%) up to once per hour if glucose predicted to be above 180

- Can enter a finger stick or CGM reading every 2 hours if a full correction dose is needed. (not the same as the automatic correction)

- User must enter in all carbohydrates eaten
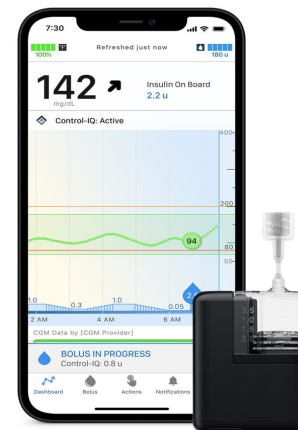
Tandem Mobi
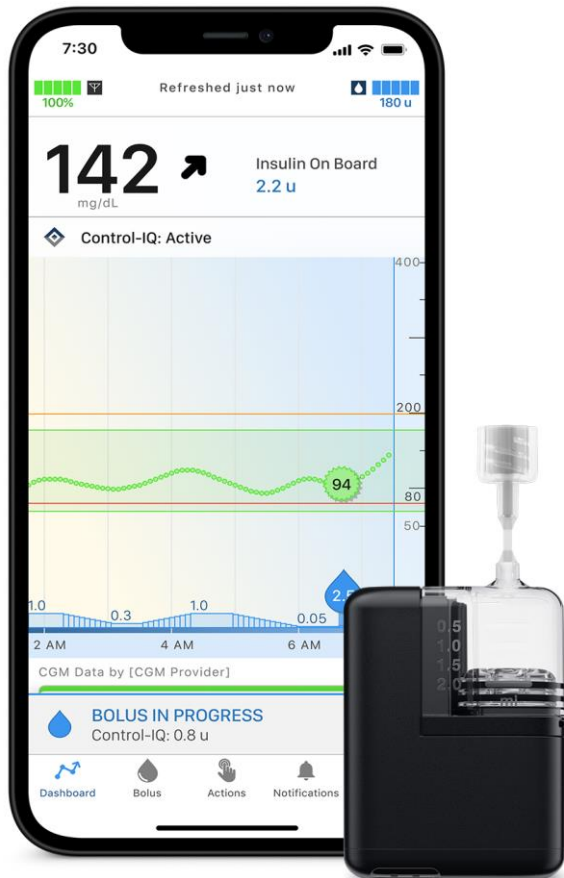
Tandem Mobi

- Communicates with the Dexcom G6 and G7
- Controlled by Tandem Mobi Mobile app on iPhone (Patient **MUST** have cell phone)
- Must be within 20 feet of iPhone to bolus
- May use the clip provided or purchase adhesive sleeve to wear on the body
- Automated system using Control IQ Technology if wearing Dexcom G6 or G7
- Does not "kick" out of modes
- Still need to enter in Carbohydrates eaten and Glucose reading (Fingerstick or CGM)

Control IQ: (Target 110 -not adjustable) CGM will predict glucose levels 30 minutes in advance, the pump then suspends basal insulin when glucose predicted to be at low level, slows down basal insulin, increases basal insulin, and can give an auto correction bolus up to once every hour if needed to keep the glucose within the Target range of 112.5-160mg/dL

Exercise Mode: Target range 140-160. Suspends at 80 (Must turn on/off)
Sleep Mode: Target range 112.5-120, no auto corrections
 (Set times to automatically turn on and off)

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Bolus Dosing

Tandem Mobi Insulin Pump

Bolus Dosing

Bolus Dosing

9. 5.5 u Bolus Confirmed

10. Refreshed just now
166 mg/dL
Insulin On Board 0.5 u
Control-IQ: Active
94
BOLUS IN PROGRESS
Standard: 5.5 u
Dashboard   Bolus   Actions   Notifications   Settings

11. 175 mg/dL
Insulin On Board 5.5 u
Control-IQ: Active
Dashboard   Bolus   Actions   Notifications   Settings
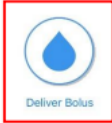
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Tandem Mobi Exercise Mode

Tap **Actions** from the Navigation bar.
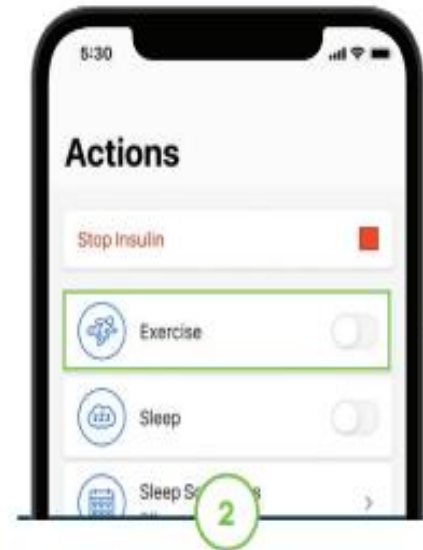
Toggle **Exercise** on.

Note: In order to use Exercise or Sleep, the pump must be integrated with CGM and Control-IQ technology must be turned on.

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Tandem Mobi Exercise Mode

Use the smartphone's security feature to verify identity.

⚑ **Note:** The system uses device authentication to ensure data security and patient confidentiality.

Exercise is now enabled.

⚑ **Note:** If active, the Sleep Activity will automatically be disabled if Exercise is enabled.

When enabled, an icon will display in the Activity Bar.

To turn off the Exercise Activity, tap the toggle again.

Activity Mode Letter

Exercise Mode = Tandem t:slim or Mobi (Target 140)

Activity Mode = Omnipod 5 (Target 150)

Temp Target = Medtronic 780G (Target 150)

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CHILDREN'S OF ALABAMA CHILDREN'S PARK PLACE CLINIC B ENDOCRINOLOGY
1601 FIFTH AVE SOUTH
BIRMINGHAM AL 35233
Dept: 205-638-9107

May 30, 2024

John Doe is a 11 y.o. year old male on an Omnipod insulin pump. Please allow them to change pump mode to Activity Mode as needed before increase activity times to help prevent low blood sugars.

Change mode 30 minutes to 1 hour before expected activity and may be extended one hour past activity as patient tolerates.

Please call our office with any questions or concerns at 205-638-9107.

Sincerely,

xxxxxxxxx, MD
Children's of Alabama
Division of Endocrinology
Phone: 205638-9107
Fax: 205-638-9821

iLet

iLet

- Different from all other Automated insulin pumps
- Must have Dexcom G6 or Dexcom G7 to use this insulin pump
- **Will not function without a CGM**
- Determines 100% of all insulin doses
- Algorithm communicates with the CGM to make all insulin dosing decisions- no carb ratios, no correction formulas, and no basal rates programmed
- Ease the burden of carbohydrate counting
- Must be "carb aware" to estimate carbs in a meal (Usual, More, or Less)
- Need to announce a meal before eating if possible
- Touch screen
- Tubing
- Rechargeable battery – charging pad. If battery dies, then the pump will not function

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iLet School Information

- Announce a meal as **"Usual for me"** before eating
- This is listed on the Prescriber Authorization Form
- If it has been longer than 30 minutes since the student started eating, then DO NOT announce the meal
- If a meal is announced more than 30 minutes after eating, this could cause a low – let the algorithm take care of the hyperglycemia
- For snacks, choose the meal (breakfast, lunch, or dinner) closest to the snack time and choose **"Less than"** to dose
- If less than 15 grams of carbohydrates, you do not have to announce because the algorithm will recognize the glucose rise and start to deliver insulin to help
- Continue to wear the pump with activity
  - ❖ If need to disconnect, may pause insulin delivery—will not resume insulin until you tell it to!
- The algorithm should recognize impending hypoglycemia and reduce or pause insulin delivery
- Treat hypoglycemia if needed (Careful not to overtreat)
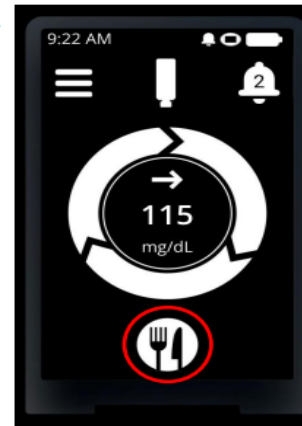 - ❖ Try to only treat after the iLet has alarmed "low soon" or "low" to allow algorithm to learn
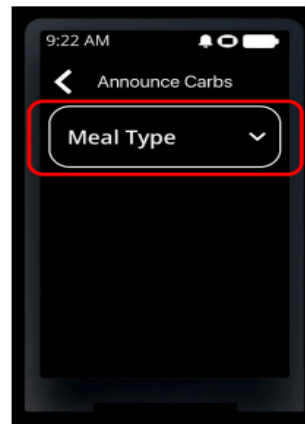
Bolus Dosing

iLet Insulin Pump
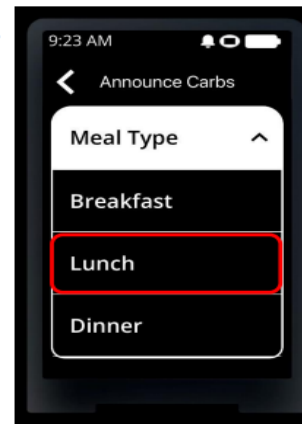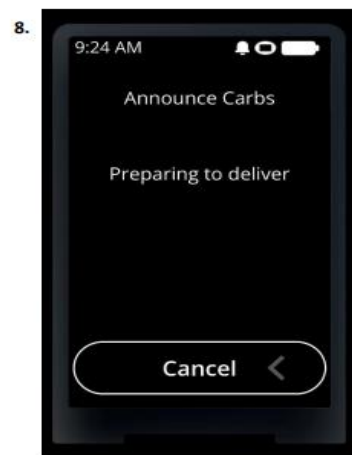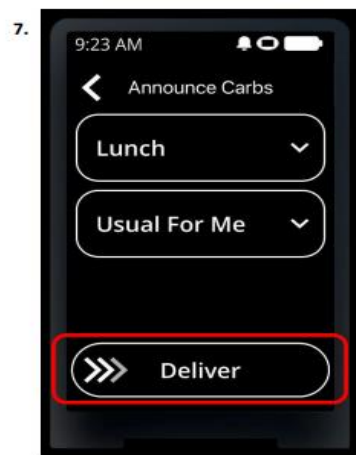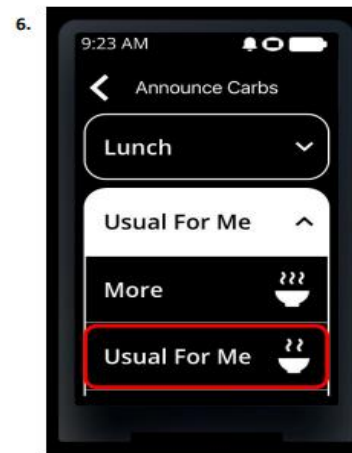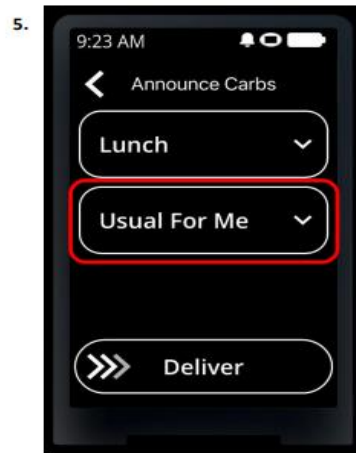
Bolus Dosing

Bolus Dosing
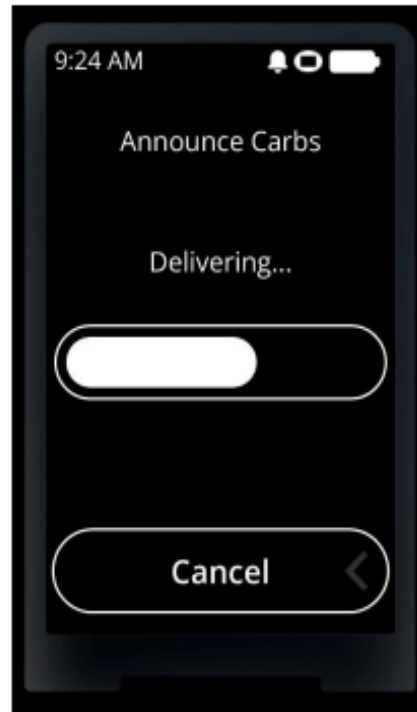
Pause Insulin Delivery (Activity)
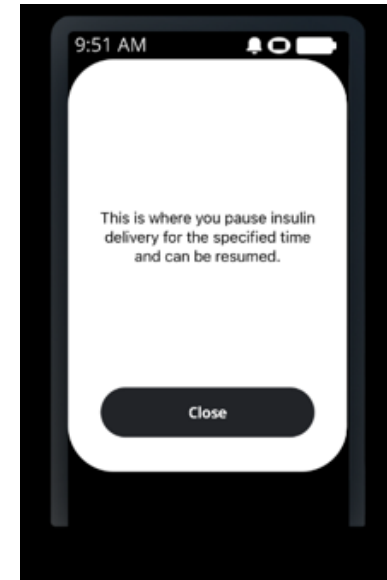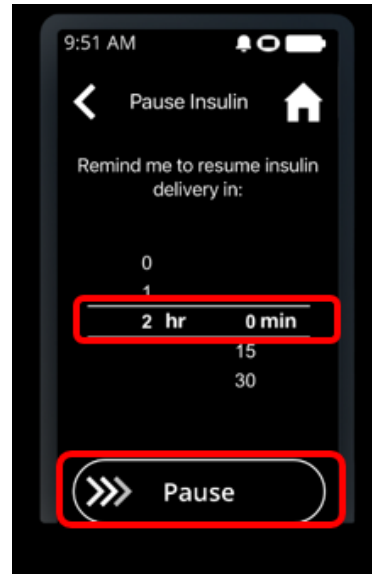
iLet School Information

- If no Dexcom, then the pump will go into "BG run mode"
- Max of 72 hours – You will be alerted to enter in a blood glucose manually, if you do not, then the pump will shut down and turn off – No insulin delivery at this point
- Follow the "pump failure" section on the PPA – you will have a carb ratio and correction formula (Must wait 3 hours between correction doses if back on injections)
- Basal insulin dose (Long Lasting) also listed.
  - ❖ The parent is not required to leave this insulin at the school
- The nurse can call family to see if they are able to come give the long-lasting dose, within an hour of pump failure
- If they are unable, then follow the PPA orders for carb ratio and correction formula use
- The student will also bring a copy of the iLet Ketone Action Plan

How to Enter a Glucose for BG- Run Mode
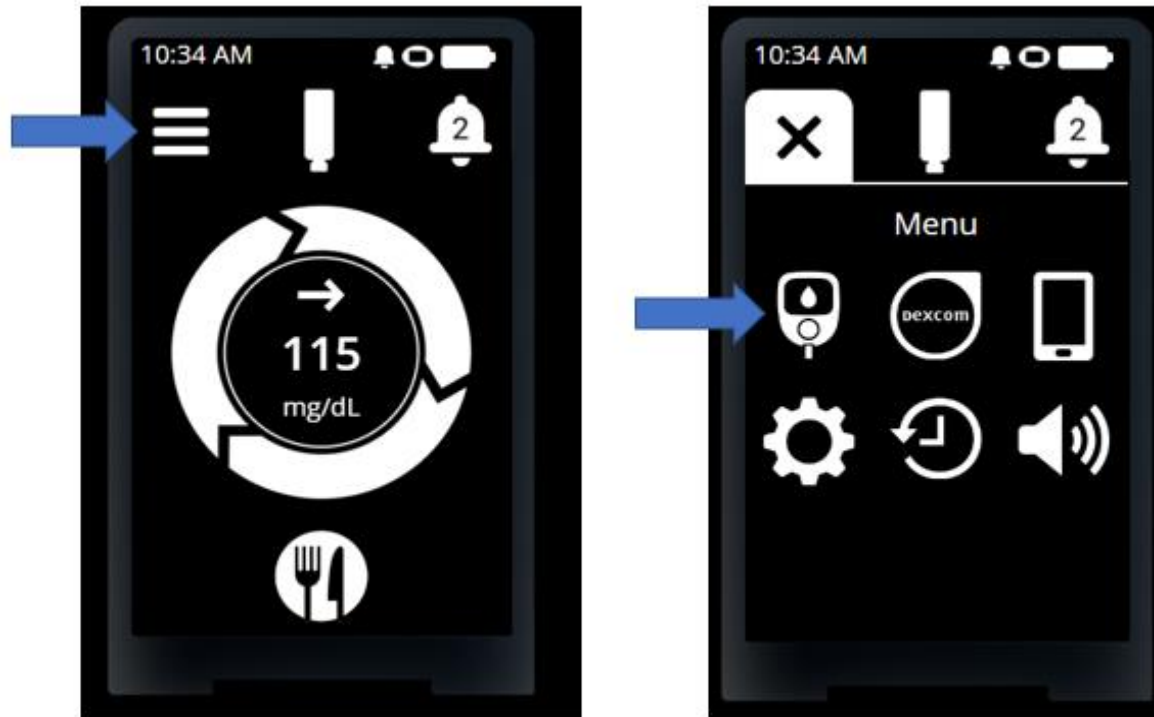
iLet School Form

UAB MEDICINE
DEPARTMENT OF PEDIATRICS

PRESCRIBER AUTHORIZATION
STUDENT INFORMATION

Children's of Alabama

Student's Name:
Date of Birth:
Age:
Allergies:

Pump Therapy- iLet Beta Bionic- p.1 of 2

START DATE: **STOP DATE:** ***

Name of Medication: **Insulin (***)**
Dosage: Meal Announcement

MEAL TYPE	MEAL SIZE
Breakfast	Usual for me
Lunch	Usual for me
Dinner	Usual for me
Snack- Choose Meal type "Lunch"	Less

- **Do Not Announce Meal** if the meal or snack you are eating has less than one quarter (25%) of the carbs in your Usual for me meal, you do not need to announce
- Meals should be announced right before the student eats
- If it has been more than 30 minutes since the student starting eating DO NOT announce food.
- **See page 2 for Pump Failure Instructions**.

Reason for taking medication: Control blood sugars
Potential side effects/contradictions/adverse reactions: Low blood sugars. See Medical Plan
Treatment order in the event of an adverse reaction: See Medical Plan
SPECIAL INSTRUCTIONS
Is the medication a controlled substance?   No
Is self-medication permitted and recommended?   {Yes/No/Supervised:27084}
If "yes" I hereby affirm this student has been instructed on proper self-administration of the prescribed medication.
Do you recommend this medication be kept "on person" by student? {yes/no:28786}
Unopened insulin must be refrigerated
Name of Licensed Healthcare Provider: Date:
Phone: (205) 638-9107 Fax: (205) 638-9821

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iLet School Form

UAB MEDICINE
DEPARTMENT OF PEDIATRICS

PRESCRIBER AUTHORIZATION
STUDENT INFORMATION

Children's
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Student's Name:
Date of Birth:
Age:
Allergies:

Pump Therapy- iLet Beta Bionic- **p.2 of 2**
Ilet Beta Bionic Pump Failure Dosing Instructions – Insulin to Carbohydrate Ratio

START DATE: **STOP DATE: ***

Pump Failure:
For pump failure (remove pump and resume insulin injections)
Notify caregiver(s) so long-acting insulin can be administered
The rapid acting insulin may be administered by syringe injection for insulin to carbohydrate ratio and correction factor doses.
Remember you must wait 3 hours between correction factor dose administrations but give meal dose as scheduled.
Student does not need to go home (unless he/she meets criteria in the Diabetes Medical Plan)

Basal Insulin Dose (If available)
Name of Medication: **Insulin (***)**
Dosage: *** unit(s); Route: Subcutaneous one dose as soon as possible after pump failure

_____

Correction Dose

Name of Medication: **Insulin(***)**
Bolus Ratio   **Time Ratio**
1 unit per *** grams of carbohydrate before breakfast
1 unit per *** grams of carbohydrate before lunch
1 unit per *** grams of carbohydrate before dinner
1 unit per *** grams of carbohydrate before snack
Give Correction Factor every 3 hours
Blood sugar - (***) = x units
                    (***)

_____

Reason for taking medication: Control blood sugars
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If "yes" I hereby affirm this student has been instructed on proper self-administration of the prescribed medication.
Do you recommend this medication be kept "on person" by student? {yes/no:28786}
Name of Licensed Healthcare Provider   Date:
Phone: (205) 638-9107 Fax: (205) 638-9821

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iLet Ketone Action Plan

iLet Bionic Pump Ketone Action Plan

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iLet Bionic Pump supplies – Keep these supplies with you at all times
- Glucose meter and strips
- Urine ketone strips or blood ketone meter strips
- Extra CGM (continuous glucose monitoring) sensor
- Extra infusion set and cartridge
- Insulin vial and syringe or insulin pen and pen needle

When to test your blood glucose and ketones:
- You have nausea, vomiting, or diarrhea
- You think your infusion set is not working
- CGM glucose has been greater than 300mg/dL for 90 minutes
- CGM glucose is greater than 400 mg/dL

Green Zone

- Urine ketones are negative

OR

- Blood ketones are less than 0.6 mmol/L

Make sure your iLet is charged, has insulin, and is displaying CGM values. Infusion set is in place and not leaking

Continue to monitor you blood glucose.

If it is still high after 90 minutes, check ketones again.

Yellow Zone

- Urine ketones are trace – moderate

OR

- Blood ketones are 0.6 – 2.5 mmol/L

Change your iLet infusion set.

Drink water.

Recheck blood glucose and ketones in 90 mins.

If blood glucose is less than 180 mg/dL and ketones are in the GREEN ZONE, there is nothing else to do.

If blood glucose is less than 180mg/dL and Ketones are the same or improved, check blood glucose and ketones in 90 minutes.

After 3 ketone checks, if blood glucose is less than 180mg/dL and ketones are trace, there is nothing else to do.

If blood glucose is greater than 180mg/dL and ketones are NOT in the GREEN ZONE, go to RED ZONE

Red Zone

- Urine ketones are large

OR

- Blood ketones are 2.5 mmol/L or higher

CALL YOUR HEALTHCARE PROVIDER IMMEDIATELY
If your healthcare provider has told you to take and insulin injection, follow the steps below:

Disconnect from the iLet at the time of the injection.

Give the injection of rapid acting insulin as instructed by your healthcare provider.

Drink water.

Recheck blood glucose and ketones in 90 minutes.

If blood glucose is less than 180mg/dL and ketones are in the GREEN ZONE, change the iLet infusion set and reconnect to the iLet.

If blood glucose is greater than 180mg/dL and ketones are NOT in the GREEN ZONE, call your healthcare provider, go to the emergency room, or call 911.

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iLet Ketone Action Plan

- The iLet Ketone Action Plan is currently being formatted and will be included in the Medical Management Plan once they are updated
- Until then, when the student receives training, we will send the Ketone Action Plan from iLet to include with their school orders

Things to Know:

- If the CGM reading is above 300mg/dL for 90 minutes or above 400mg/dL at any point assume the site is not working correctly
- Contact the family to come change the site/ if student is marked "independent" have them change the site
- If you disconnect and give a correction dose via injection, then the pump must stay disconnected for 90 minutes
- If after this time the BG is less than 180mg/dL and ketones negative then reconnect to the iLet

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Information

- Recording of the iLet insulin pump is uploaded to Myschoolnurse.net
- Plans to include Activity/Exercise information to the Medical Management Plan
- iLet Ketone Action Plan will be included in upcoming updates to the Medical Management Plan
- All previous School Nurse Workshop videos and bolus dosing information on myschoolnurse.net

SCAN ME

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Questions