THE CHARLES H. BEST DIABETES CENTRE

# PUMP SCHOOL MANUAL

Your essential guide to insulin pump therapy.

## About the Pump School Manual

Starting insulin pump therapy is an exciting and empowering step in managing type 1 diabetes. This manual is designed to be both a learning guide and a long-term reference to help you navigate pump therapy with confidence. It will provide you with the knowledge and tools needed to optimize pump use, troubleshoot common issues, and ensure the best possible diabetes management.

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## Key Terminology

Understanding these key terms will help you navigate insulin pump therapy with confidence.

**Automated Insulin Delivery (AID)**: An algorithm that combines the technology from an insulin pump and compatible glucose sensor to automate insulin delivery. Based on the sensor data, the algorithm will increase, decrease or stop basal insulin, and in some systems deliver an automated correction dose.

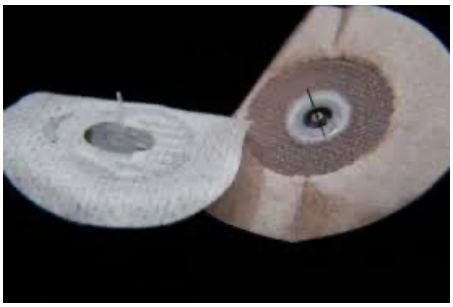
**Basal Insulin**: A continuous, low-dose delivery of insulin by the pump, replacing long-acting insulin (e.g., Lantus®, Levemir®, Toujeo®, Tresiba®, Basaglar®).

**Bolus Insulin**: Insulin delivered at meal/snack times or to correct a high blood sugar. Programmed into your pump as a carb ratio (ICR) and insulin sensitivity/correction factor (ISF).

**Bolus Calculator**: Blood sugar and carbs are entered into the bolus calculator in your pump. The bolus calculator uses your programmed carb ratio (ICR), insulin sensitivity/correction factor (ISF), blood sugar target and active insulin time to recommend a bolus dose.

**Blood Sugar Target**: The blood sugar your pump is trying to achieve when you bolus for food or correct a high blood sugar. Different targets can be programmed throughout the day and night.
With AID, you can also select different blood sugar targets for the automation.

**Cannula**: A small (a few millimetres) flexible tube by which insulin is delivered. Inserted under the skin with a needle that is then removed, leaving the cannula in place. No needle remains under the skin. The cannula is connected to the pumps tubing through an infusion set site. Tubeless Pumps: the cannula projects from the underside of the pod, there is no tubing.



**Infusion Set:** The way insulin is delivered to your body from the pump. Consists of tubing that connects the pump to an infusion site. Infusion sites can be inserted manually or with an insertion device, they come with different cannula types (optional steel needle) and lengths, tubing lengths and insertion angles. The infusion set is changed every 2-3 days to maintain optimal insulin delivery and prevent site infections.

**Insulin on Board or Active Insulin (IOB):** the amount of insulin still active from a previous bolus. The duration varies from 2 to 5 hours depending on the recommendations for optimization for each pump. The pump's bolus calculator automatically adjusts the suggested correction dose to prevent insulin stacking (which occurs when multiple doses of rapid-acting insulin are administered too close together) and low blood sugars.

**Insulin Sensitivity Factor (ISF),** also called the **Correction Factor:** The amount blood sugar is expected to decrease with 1 unit of rapid-acting insulin. It is used to calculate how much insulin is needed to bring blood sugar back into target. For example, an ISF of 1:2 means that 1 unit of insulin will lower blood sugar by 2 mmol/L. The lower the insulin sensitivity/correction factor number, the greater the calculated insulin dose.

**Insulin-to-Carbohydrate Ratio (ICR):** The amount of insulin needed per gram of carbohydrate consumed. This ratio helps determine how much insulin to give for meals and snacks. The lower the carb ratio, the greater the calculated insulin dose.

**Reservoir/Cartridge:** Holds the insulin needed for the pump. Connected to the pump via tubing and an infusion set site. Holds between 160-300 units of rapid-acting insulin depending on the pump.

**IMPORTANT NOTE:** Insulin brands and biosimilars continue to evolve. Your healthcare team will guide you in choosing the most suitable option for you/your child.

## What is an Insulin Pump?

An insulin pump is a small, computerized medical device used to deliver insulin. Insulin pumps deliver **rapid-acting insulin** in two ways:

1. **Basal Insulin**:
   - The continuous small, steady dose of insulin delivered 24-hours a day to replace your long-acting insulin.
   - Maintains blood sugar levels between meals and overnight.
   - Measured in units per hour, basal rates are programmed into the pump.
   - Different basal rates can be programmed throughout the 24-hour time period based on individual needs.
   - Temporary basal rates can be used to increase or decrease the basal insulin for changes in activity.

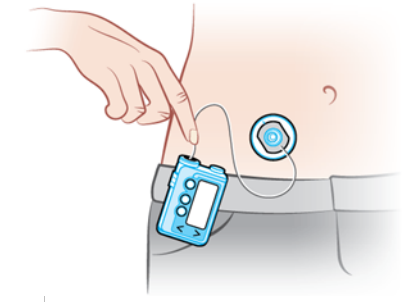
2. **Bolus Insulin**:
   Additional insulin delivered for:
   - Food Bolus:
     - Given before meals and snacks to prevent a rise in blood sugar
     - Based on the grams of carbohydrates you enter into the pump
     - Programmed into your pump as a carb ratio

   - Correction Bolus:
     - Insulin given to lower blood sugar that is above target.
     - Programmed in your pump as an insulin sensitivity/correction factor

     The carb ratio and correction factor programmed into your pump may not be the same as when you were on injections.
     Bolus doses can be delivered in different ways; now versus extended over a period of time.

**IMPORTANT NOTE**: Insulin pumps deliver only rapid-acting insulin.

**Insulin pumps** can be **tubed** or **tubeless.**



A **tubed pump** is about the size of a deck of cards. It is worn outside the body and delivers insulin through a thin tube connected to a small cannula inserted under the skin. A tubed pump can be worn around the waist, attached to a belt or bra, in a pocket or on an armband.

**A tubeless pump (pod)** is attached directly to the skin.

## What is Automated Insulin Delivery?

Automated Insulin Delivery (AID) uses an algorithm to combine the technology from an insulin pump and compatible glucose sensor to automate insulin delivery. Based on the sensor data, the algorithm will increase, decrease or stop basal insulin, and in some systems deliver an automated correction dose.

## Why is Managing High Blood Sugars Different on an Insulin Pump?

Insulin pumps use ONLY rapid-acting insulin. If insulin delivery is interrupted, you can be without ANY insulin within 4 hours. This can quickly lead to diabetic ketoacidosis (DKA), a serious and life-threatening condition that requires immediate attention.

## What is DKA?

DKA occurs when there is little, or no insulin present in the body and sugar cannot be used for energy. Instead, the body burns fat and protein for fuel, producing ketones as a by-product. Ketones are acids that can cause the body to become dangerously acidic.

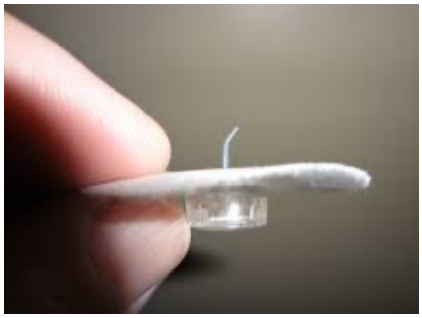
### Signs of DKA:

- Early Symptoms:
    - Extreme thirst, dry mouth, frequent urination, fatigue
- Severe Symptoms:
    - Nausea, vomiting, abdominal cramps
    - Difficulty breathing

### Why is There a Greater Risk of DKA with an Insulin Pump?

DKA can develop much faster on a pump compared to insulin injections because:

- You do not have long-acting insulin working in the background. If there is an interruption in insulin delivery, you are not getting **ANY** insulin. On injections, if you missed a mealtime or correction dose, your long-acting insulin was still working in the background, this protected you from DKA.
- You cannot see what is happening under your skin. You cannot see if the canula is bent/kinked or if it has come out; this can happen even if the infusion site/pod is still stuck onto your skin. On injections, you know the insulin went in because you felt it go through the skin. If there was a problem, you could feel resistance on the pen tip. On a pump you are pushing buttons, you don't know if the insulin goes in.



## How do I know if there is a problem with insulin delivery?

A high blood sugar is often the first sign that something may be wrong with insulin delivery.

## Will the pump alarm if there is a problem with insulin delivery?

Yes but ….

Occlusion alarms indicate when there is a blockage preventing insulin delivery. They are triggered by pressure build up within the tubing and infusion site. However, since basal doses are small, it often takes many hours before there is enough pressure to trigger an occlusion alarm, and you may already have high blood sugars and ketones.

Also, if the infusion site/pod has moved and/or is leaking, there is no pressure build up and an occlusion alarm will not be triggered.

Alarms are helpful but you cannot rely exclusively on alarms.


**Warning: Never Ignore High Blood Sugars!**

## How Do I Prevent DKA?

**Check for ketones if:**

- ❑ You have unexplained high blood sugars above 14mmol/L that are not coming down with a bolus correction dose within 3-4 hours
- ❑ You vomit: Vomiting is a sign of DKA. Whenever you/your child has nausea and vomiting, always test blood for ketones. Do not assume it is the flu or food poisoning.
- ❑ If You are sick: illness can cause high blood sugars and insulin resistance, leading to DKA.

## Troubleshooting High Blood Sugar

Your insulin pump is a mechanical device, and like all devices, **it can fail.**

**If Your Pump Malfunctions:**

1. Call the 1-800 number on the back of your pump or controller to report the issue. Pump companies can typically deliver a replacement within hours.
2. If in doubt, replace the infusion site/pod, reservoir/cartridge and insulin.
3. Switch to pen injections for temporary pump removal less than 24 hours.

**If your blood sugar is high, consider the following:**

### Step 1: Quick Self-Check

High blood sugar can happen from time to time, and there are many possible reasons. Take a moment to reflect:

- **Did you forget to bolus or enter carbs into your pump?**
  That happens to everyone now and then. You can check your pump's bolus history to confirm if you missed a bolus. If this is the case, enter your current blood sugar into the pump to receive a correction dose. (If it's been about an hour since eating, do not enter carbs, just your blood sugar.)

- **Did you try a new food or guess the carb amount?**
  That's okay! Use your blood sugar and your bolus calculator to get a correction dose. Your blood sugar should start to come down in the next 3–4 hours.

- **Did you intentionally give less insulin because of activity or not feeling well?**
  This can be a smart decision sometimes. Keep monitoring your blood sugar closely and give corrections as needed.

- **Do you notice this happens around the same time regularly?**
  A pattern like this might mean your pump settings need adjusting. Reach out to your diabetes educator if you would like some help.

- **Are you feeling unwell?**
  Illness can raise blood sugars and increase the risk of DKA. Be sure to check ketones if you are sick.

### Step 2: Pump & Infusion Site Check – Is It the Equipment?

If there is no clear reason for the high blood sugar, it might be pump or infusion site related. Here's what to check:

**Look at the pump:**

- Is it powered on? Does it need to be charged or need a new battery?
- Are there any alerts or error messages? If so, follow the prompts or call the pump company for help.
- Is there enough insulin in the reservoir/cartridge, or pod?

**Check your infusion site or pod:**

- Is it still properly attached to your skin? If it has come off, you are not getting any insulin.
- Is the site wet or leaking? This could mean insulin is escaping instead of being delivered.
- Is the site red, swollen, or irritated? This could affect how well insulin is absorbed and may need attention.

## Treatment Guidelines for High Blood Sugar

If the pump appears to be working and you do not see any obvious issues with the infusion site/pod, check ketones to give you more information about what to do next.

**IMPORTANT NOTE**: Use a blood ketone meter and blood ketone strips to check for ketones.

### Check for ketones:

When you have unexplained high blood sugars above 14mmol/L that are not coming down with a bolus dose within 3-4 hours.

#### When ketones are NOT present

1. Give a correction bolus using the pump (if possible, avoid eating)
2. Recheck blood sugar in 1.5-2 hours. If blood sugar remains high or does not start to come down:
   (a) Check ketones again, if you now have ketones, follow the steps below
   (b) If you do not have ketones and your blood sugar continues to be high, continue to correct through the pump by entering the blood sugar into the bolus calculator.

**Consider a finger poke to confirm a high blood sugar on a sensor.**

3. Continue to monitor blood sugar regularly until levels are moving towards the target range.

#### When ketones ARE present

1. **Act immediately**! You need insulin to correct the high blood sugar AND extra insulin to clear the ketones from your body.
2. **Give insulin by pen injection**. See below for how much insulin to give by pen injection.
3. **Replace everything**: infusion site/pod, tubing, reservoir/cartridge and insulin.

**Supplies needed to manage ketones**

- ❑ Blood ketone meter and ketone strips. Check expiry date
- ❑ Blood sugar meter, test strips
- ❑ Finger poker
- ❑ Pen tips and insulin pens or cartridges

## How much insulin do I need to manage ketones

Use the **Total Daily Dose (TDD)** formula and the provided chart as a guide to determine how much rapid-acting insulin to give for ketones.

### Step 1: Determine your TDD

- Access the pump's history menu to find the average TDD for the last 3 days*.
- If you are unsure how to locate this information, refer to the pump user manual or consult your diabetes educator.

**TDD = _____ units**

### Step 2: Determine how much insulin for ketones

Using the chart below, determine how much rapid-acting insulin to give based on *blood sugar and blood ketone levels.*

| | UNDER 10 YEARS OF AGE | | OVER 10 YEARS OF AGE / Adults |
|---|---|---|---|
| Blood ketones | Blood sugar 14-20 mmol/L | Blood sugar greater than 20 mmol/L | Blood sugar greater than 14 mmol/L |
| Less than 0.6 mmol/L | No extra | Give 5% of TDD | Give 10% of TDD |
| 0.6 - 1.4 mmol/L | Give 5% of TDD | Give 10% of TDD | Give 15% of TDD |
| 1.5 - 3.0 mmol/L | Give 10% of TDD | Give 15% of TDD | Give 20% of TDD |
| Greater than 3.0 mmol/L | Give 15% of TDD | Give 20% of TDD | Give 20% of TDD |

**For example:**
12-year-old Frank, with a blood sugar of 18 mmol/L, and blood ketones of 2.1, requires 20% TDD to clear his ketones.

**Seek medical attention immediately if ketones are greater than 3.0 mmol/L and persist or worsen despite insulin injections by pen.**

*Talk to your Diabetes Educator if you are using Humalog U200 insulin for important information regarding the TDD.

## Step 3: Calculate the Insulin Dose for Ketones

Use the chart below to calculate the insulin dose based on the %TDD determined above.

| Total Daily Dose (TDD) | 5% of TDD | 10% of TDD | 15% of TDD | 20% of TDD |
|---|---|---|---|---|
| 5 - 15 units | 0.5 unit | 1 unit | 1.5 unit | 2 unit |
| 16 - 25 units | 1 unit | 2 units | 3 units | 4 units |
| 26 - 35 units | 1.5 units | 3 units | 4.5 unit | 6 units |
| 36 - 45 units | 2 units | 4 units | 6 units | 8 units |
| 46 - 55 units | 2.5 units | 5 units | 7.5 units | 10 units |
| 56 - 65 units | 3 units | 6 units | 9 units | 12 units |
| 66 - 75 units | 3.5 units | 7 units | 10.5 units | 14 units |
| 76 - 85 units | 4 units | 8 units | 12 units | 16units |
| 86 - 95 units | 4.5 units | 9 units | 13.5 units | 18 units |
| 96 - 105 units | 5 units | 10 units | 15 units | 20 units |
| 106 - 115units | 5.5 units | 11 units | 16.5 units | 22 units |
| 116 - 125 units | 6 units | 12 units | 18 units | 24 units |

**For example:** Frank's TDD is 45 units. 20% of TDD is 8 units. Frank needs 8 units to clear his ketones.

## Step 4: Calculate the insulin dose to correct the high blood sugar

To calculate the insulin dose needed to correct the high blood sugar, you need to know your/your child's:

- Insulin sensitivity/correction factor
- Blood sugar target

For example: Frank's blood sugar is 18 mmol/L, correction factor 4, target is 6 mmol/L.

| Blood sugar | - | Target | = | Amount to correct | ÷ | Correction factor | = | Correction dose |
|---|---|---|---|---|---|---|---|---|
| **18 mmol/L** | | **6 mmol/L** | | **12 mmol/L** | | 4 | | **3 units** |

**For example:**
Frank needs 3 units to correct high blood sugar.

## Step 5: Add it up: insulin for ketones plus correction

Add up the insulin needed to clear ketones plus the insulin for correction, give this as a single dose by pen injection.

**For example:** Frank needs 11 units: 8 units for the ketones and 3 units for the high blood sugar.

Refer to Appendix 1 worksheet if you need to calculate insulin doses for ketones and correction.

## Step 6: Change your infusion site/pod, tubing, reservoir/cartridge and insulin

Change it, even if you just changed it. Remember, you cannot see what is happening under your skin. If you have ketones, there is something wrong with the pump, infusion site/ pod, tubing or the insulin. Continuing to use the pump to correct a high blood sugar delays treatment of ketones and puts you at risk for serious medical issues requiring hospitalization.

Note: Using Omnipod 5 – go to step 7 BEFORE putting on a new pod.

## Step 7: AID (automated insulin delivery) adjustment

If you are NOT using an automated insulin pump, resume insulin delivery through your new infusion site/pod and go to Step 8.

If you are using an automated insulin pump, follow the instructions below. Automated insulin pumps are designed to give more insulin when blood sugars are high, however the algorithm does not know that you gave insulin by pen. To

prevent a low blood sugar after giving insulin by pen, follow the instructions below, based on your pump.

Tandem pump

Deliver an "air bolus" for the total amount of insulin you gave by pen injection. An "air bolus" will update the IOB (insulin on board) so that the algorithm can account for the insulin provided by pen. Then, the algorithm will adjust automated insulin appropriately and safely. To do this:

1. Disconnect the new infusion site from your body.
2. Deliver a manual bolus into a napkin for the total amount of insulin you gave by pen injection.
3. Reconnect your new infusion site to your body.

Medtronic pump

1. Turn SmartGuard off for 4 hours.
2. Set a timer and restart SmartGuard in 4 hours to go back into automation.

Omnipod 5

**Before** starting a new pod, deliver an "air bolus" for the total amount of insulin you gave by pen injection using the old pod. This "air bolus" will update the IOB (insulin on board) so that the algorithm can account for the insulin provided by pen. Then, the algorithm will adjust automated insulin appropriately and safely. To do this:

1. Remove your pod. **Do not** deactivate the pod.
2. While the pod is not attached to your skin and still active, deliver a manual bolus into a napkin for the total amount of insulin you gave by pen injection.
3. Deactivate the pod.
4. Put on a new pod. Stay in automated mode.

**If you had a pod failure or are out of insulin in the old pod**, you will not be able to do an "air bolus" before deactivating the pod. Instead:

a. Switch to Manual Mode for 4 hours
b. Set a timer and restart automated mode in 4 hours to go back into automation.

Ypso pump with CamAPS fx app:

1. Turn Auto Mode off for 4 hours.
2. Set a timer and restart Auto Mode in 4 hours to go back into automation.

## Step 8: Follow-up

1. Check blood ketones every 2-3 hours. You may need to give more than one dose of insulin to clear ketones.
2. Monitor blood sugar hourly. Check by finger poke if your sensor is reading HI and not giving you a blood sugar number.
3. Continue to correct high blood sugars. Once you have changed your infusion site/pod, tubing, reservoir/cartridge and insulin, you can give correction doses through the pump until your blood sugars start to come into target.
4. Keep hydrated: drink plenty of water or sugar-free fluids. Water alone will not treat ketones. Water along with the extra insulin by pen will help to flush the ketones out in your urine.
5. Rest: never exercise if ketones are above 1.5mmol/L.

**IMPORTANT NOTE:** Monitor blood sugar and blood ketones every 2-3 hours.

## Important Considerations for Insulin Pump Therapy Overnight

Follow these tips to avoid issues at night when you are sleeping which may delay timely interventions and increase your risk of high blood sugars, ketones and DKA.

**Avoid changing your infusion site/pod right before bed.**

- While sleeping, you may miss infusion site/pod problems. Poor absorption or improper adhesion can lead to high blood sugars overnight, increasing the risk DKA.
- If a bedtime infusion site/pod change is unavoidable:
  - Set the high alarm on your sensor to alert you of persistent high blood sugars.
  - If you are not using a sensor, set an alarm to recheck blood sugar in 3-4 hours to confirm the new infusion site/pod is working properly.

**Correct high blood sugars before bed**

- To avoid staying high all night, correct high blood sugars before bed by entering the blood sugar into the bolus calculator.
- Even on automated pumps, correct a high blood sugar before bed. The automation will eventually bring your blood sugar down however it often takes many hours.
- Book an appointment with a diabetes educator if you are concerned about correcting at bed.

**Do you have enough insulin in your pump?**

- To avoid running out of insulin overnight ensure that you have enough insulin in your reservoir/cartridge/pod to make it through the night, even if you sleep in.
- What is your low insulin alert set at? Set your low insulin alert amount so that you have enough insulin to get you through the night including a sleep in.
- Automated pumps give more insulin if your blood sugars are high to bring you into target, ensure you have enough insulin to cover any insulin you might get.
- If you run out of insulin, you are at very high risk for DKA.

**Is your pump charged?**

- To avoid your pump shutting off overnight, ensure your pump is charged before going to bed.
- If your pump shuts off, you will not get any insulin and are at risk for high blood sugars, ketones and DKA.

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## How is Illness Managed on an Insulin Pump?

Stress hormones are released as part of your body's response to illness. This can lead to high blood sugars even if you/your child are not eating.

**Check for blood ketones if:**

- Blood sugars are not coming down despite correction boluses
- Vomiting

Do not assume the illness is causing the vomiting, it could be ketones.

Illness, nausea, vomiting, diarrhea and/or changes in food and fluid intake can also lead to low blood sugars.

**Basal insulin is always necessary:**

- Even if you/your child are not eating or feeling unwell, never suspend your insulin pump.
- Basal insulin is critical to prevent DKA.
- Use pump features such as a temporary basal rate, exercise activity or temp targets to decrease the basal insulin delivered and prevent low blood sugars. See pump manual for more information on how to use these features.

**During illness:**

- Stay hydrated: drink plenty of fluids.
    - If blood sugars are greater than 10mmol/L choose water or sugar-free fluids.
    - If blood sugars are less than 10mmol/L, choose sugar containing fluids.
- Increase monitoring: check blood sugar more frequently and test for blood ketones if blood sugars remain high.

## What is Low Blood Sugar (Hypoglycemia)?

Low blood sugar, or hypoglycemia, occurs when blood sugar drops below 4 mmol/L. It is essential to treat a low blood sugar immediately. The brain needs blood glucose to function; severe or long-lasting hypoglycemia is not good for the brain.
Reasons for low blood sugar include:

- Overestimating meal or snack time carbs
- Giving rapid-acting insulin more than 15 minutes before a meal or snack
- Activity without adjusting food or insulin
- Illness

**IMPORTANT NOTE:**
Treat low blood sugar right away.

**DO NOT WAIT.**

**Call 911 if:**

- Unable to safely consume fast-acting sugar by mouth
- Unconscious
- Having convulsions or a seizure

## Treatment Guide for Low Blood Sugar (Hypoglycemia)

### Mild to Moderate Hypoglycemia

- Treat with 5-15 g of fast-acting sugar, depending on your child's weight and blood sugar level.
- If blood sugar is below 3 mmol/L, add an extra 5g of fast-acting sugar. Wait 15 minutes and re-check blood sugar.
- Continue these steps until the blood sugar is above 4 mmol/L.

### Severe Hypoglycemia

- Administer glucagon if you/your child is unconscious, unable to swallow, or experiencing seizures.

**There are two ways of administering glucagon**:

- **Glucagon injection**: This is the traditional form of glucagon, administered through a syringe.
- **Baqsimi™**: A nasal spray form of glucagon administered through the nose without the need for injection

**Call 911 or seek immediate medical assistance if you use glucagon.**

**Do you have an updated prescription for Baqsimi™?**

# Guide to Fast-Acting Sugar Doses for Mild-to-Moderate Hypoglycemia by Child's Weight

| Child's weight | Less than 15 kg (33 lbs.) | 15–30 kg (33-66 lbs.) | Greater than 30 kg (66 lbs.) |
|---|---|---|---|
| **Amount of carbohydrate** | **5 g** | **10 g** | **15 g** |
| Dex4 glucose tablets | 1 | 2 or 3 | 4 |
| Dex4 LiquiBlast (bottle) | 1/3 bottle | 2/3 bottle | 1 bottle |
| Dex4 glucose gel | 1/3 tube | 2/3 tube | 1 tube |
| Juice or regular pop | 40 mL<br>or 1/4 cup | 85 mL<br>or 1/3 cup | 125 mL<br>or 1/2 cup |
| Honey, corn syrup or maple syrup | 1 teaspoon (5mL) | 2 teaspoons (10mL) | 1 tablespoon (15mL) |
| Skittles™ | 5 | 10 | 15 |

**Guidelines for Adults if Blood Sugar Under 4.0 mmol/L:**

15 grams of fast-acting sugar (carbohydrate):

- 4 glucose tabs (Dex 4) or
- 5 giant rockets or 2 packages rockets
- 125 ml or ½ cup juice or regular pop
- 15 Skittles™

### If the next meal is more than 60 minutes away:

Once blood sugar is above 4 mmol/L, have a 15-gram snack to maintain a stable blood sugar. Examples include:

- Crackers **WITH** peanut butter or cheese
- A granola bar
- Yogourt

**IMPORTANT NOTE**: It is crucial to wait until the blood sugar is above 4 mmol/L before consuming any food. Eating food too soon can slow down the absorption of fast-acting sugar and delay the rise in blood sugar.

## Automated Insulin Delivery (AID) and Low Blood Sugars

AID systems decrease and suspend insulin delivery based on the predictive trend of the sensor blood sugar. This means, the system will deliver less insulin or even stop insulin before the low blood sugar occurs. As a result, there is less insulin in your body at the time of a low blood sugar, and you need **LESS** fast-acting sugar to manage a low blood sugar. Treat with 5-10 g of fast-acting sugar.

### Guide to Treatment for Low Blood Sugar using AID:

| | **5-10 g** |
|---|---|
| Dex4 glucose tablets | 2 tablets |
| Juice | 40-85mL of juice (1/4 to 1/3 of a cup) |
| Honey, corn syrup or maple syrup | 1-2 teaspoons |
| Skittles™ | 5-10 pieces |
| Koolaid™ jammer | 180 mL |
| Rockets candy (regular) | 1 roll |
| Rockets candy (giant) | 2 candies |

**Note**: You may not need to follow up with a snack. Monitor your blood sugar closely to see if a small snack is needed.

## Confirm sensor blood sugars with a finger poke when:

- Sensor blood sugar reading is less than 4mmol/L but there are **NO** symptoms
- If you/your child feels low but the sensor blood sugar reading is above 4 mmol/L
- You treat a low blood sugar with the appropriate amount of fast sugar and wait 15 minutes, but the sensor blood sugar is still reading under 4 mmol/L

Sensors measure interstitial fluid therefore there can be a 5-10 minute delay between when changes in your blood sugar are reflected on the sensor. This is most obvious when blood sugars are rising or falling quickly such as after meals, after a bolus dose, with activity or when treating a low.

## What does Lo or Low mean on my sensor?

Lo = less than 2.0 on the Libre
Low = less than 2.2 on the Dexcom.

You/your child will likely need more fast-acting sugar to treat a lo/low blood sugar.

### Be Prepared

Always carry fast-acting sugar (such as juice, Dex4 tabs, or Skittles™) and a snack (such as granola bars or crackers) with you to treat low blood sugar promptly.

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## Handling a Low Blood Sugar Before a Meal

Treat the low blood sugar with fast-acting sugar before you eat your meal. Food, especially if it contains protein or fat, slows down how quickly the fast-acting sugar gets into your body. This will delay your blood sugar coming above 4 mmol/L and delay the amount of time it takes for you to recover from the low and feel better.

### What if my blood sugar is lower, but not low before a meal or snack?

The pump will give you less insulin if you are below your programmed target before a meal/snack when you enter the blood sugar and carbs into the bolus calculator. The reduced mealtime bolus will compensate for the lower blood sugar to bring you back into your target range. Always enter your blood sugar into your pump before a meal or snack, especially when your blood sugar is lower than your target, in order to get the reduced dose.

**Example Scenario**

- Carb Ratio: 1:10 (1 unit of insulin per 10 g of carbs)
- Target Blood Sugar: 6 mmol/L
- Meal: 40 g of carbohydrates
- Pre-meal Blood Sugar: 4.5 mmol/L

**Here's How the Pump Adjusts:**

- If blood sugar is 4.5 mmol/L: The pump subtracts insulin from the food bolus to compensate for being below target. It suggests 3 units of insulin.
- If blood sugar is 6 mmol/L: The pump calculates the full bolus and suggests 4 units of insulin.

This adjustment helps safely bring your blood sugar to the target range by decreasing the bolus insulin dose.

## Preventing and Managing Low Blood Sugar (Hypoglycemia) on an Insulin Pump

While insulin pump therapy often reduces episodes of low blood sugar compared to insulin injections, hypoglycemia remains a risk with type 1 diabetes.

With pump therapy, especially automated systems, blood sugar levels are often closer to the target range which can lead to changes in when and how you feel a low blood sugar.

- You may notice symptoms sooner or, in some cases, not at all if your blood sugar is consistently closer to target.

### General Tips to Prevent Low Blood Sugar:

- Wear a continuous glucose monitor (sensor): sensors provide real-time blood sugar data and alerts to help you detect and prevent low blood sugars.
- Choose low alarms that give you enough time to prevent a low blood sugar.
- Use pump features: temporary basal rates, exercise activity or temp targets are tools that can help prevent low blood sugars. See pump manual for more information how to use these features.

### During Activity:

- Continue to check blood sugar before, during, and after activity.
- Use pump features like temporary basal rates, temp targets, or exercise activity before, during and after (including overnight) physical activity as needed. These features work best when started 1-2 hours before activity.
- Have snacks and fast-acting sugar readily available for unplanned activity.

### When Consuming Alcohol:

- Alcohol can lower blood sugar, especially overnight.
- Use pump features like temporary basal rates, temp targets, or exercise activity before, during and after (including overnight) as needed.
- Consider a carbohydrate snack before bed. Do not give insulin for the snack.
- Speak with your diabetes educator for guidance, especially if using an automated pump.

### Basal Insulin is Always Necessary:

- Do not suspend your pump as way to treat a low blood sugar. Often the insulin that caused the low blood sugar was administered 1-2 hours ago. Remember, rapid-acting insulin starts to work in 10-15 minutes, peaks in 1.5-2 hours. Suspending your pump often makes you high 1-2 hours later.
- Automated pumps decrease insulin based on predicted blood sugars; they act before the blood sugar is low in order to prevent the low blood sugar from occurring.
- Automated pumps may suspend insulin for short periods; they resume basal insulin when blood sugar starts to rise therefore limiting the risk of ketones and DKA. Basal insulin is critical to prevent DKA.

### If You are Not Using a Sensor:

Check blood sugars before meals and before bedtime. Without a sensor, the risk of low blood sugar increases during sleep when symptoms may not be noticeable.

Check blood sugar overnight if you experience any of the following:

- Wake up sweating or soaking wet.
- Morning headaches or feeling 'foggy.'
- Increased pulse upon waking.
- Nightmares.
- Unexplained high blood sugar in the morning.

### When to Seek Help:

If you are unsure about adjusting your pump settings, upload your pump data and contact your diabetes educator.

## Site Care & Maintenance

Proper care and maintenance of infusion sites/pods is essential to prevent infection, ensure effective insulin delivery, and avoid complications. Follow these guidelines for safe and hygienic site management:

### Basic Site Care

1. **Practice proper hygiene**:
    - Wash hands thoroughly with warm, soapy water or use unscented hand sanitizer before handling the site.

2. **Clean the skin:**
    - Use a skin prep wipe, or soap and water to clean the area unless you/your child is fresh out of the shower. Alcohol wipes are not necessary and may irritate the skin.

3. **Maintain sterility:**
    - Ensure infusion sets remain sterile during insertion and handling.
    - Use the inside of the packaging (which is sterile) to prepare the infusion set for insertion.

### Signs of a Site Infection

Monitor for the following symptoms at the infusion site:

- Redness, inflammation, or swelling
- Pain or tenderness
- Warmth at the site
- Discharge (pus or fluid) at the insertion point.

#### Steps to treat a suspected infection:

1. **Remove the infusion site/pod Immediately:**
    - Do this even if the infusion site/pod has only been in for a few hours.

2. **Apply a Warm Compress:**
    - Use a clean, warm compress to the affected area to reduce swelling and discomfort.

3. **Apply Topical Antibiotic Ointment:**
    - Use a product like Polysporin™ to prevent further infection.

4. **Seek Medical Attention:**
    - If the affected area is larger than the size of a dime**,** consult a healthcare provider. An oral antibiotic prescription may be necessary.

## Preventing Infection and Infusion Site Failure

- **Change infusion sets regularly:**
    - Replace infusion sets every 2–3 days to prevent infection and poor absorption. This is critical to success.

- **Rotate sites:**
    - Alternate between and within different body areas (e.g., abdomen, thighs, buttocks, arms) to avoid: infection, scarring, site failure and/or high blood sugars

**7-Day Infusion Sets** → Some infusion sets are specifically designed for 7-day use and are made with materials safe for extended wear. This does not apply to standard infusion sets. Always follow the manufacturer's guidelines for your specific infusion set.

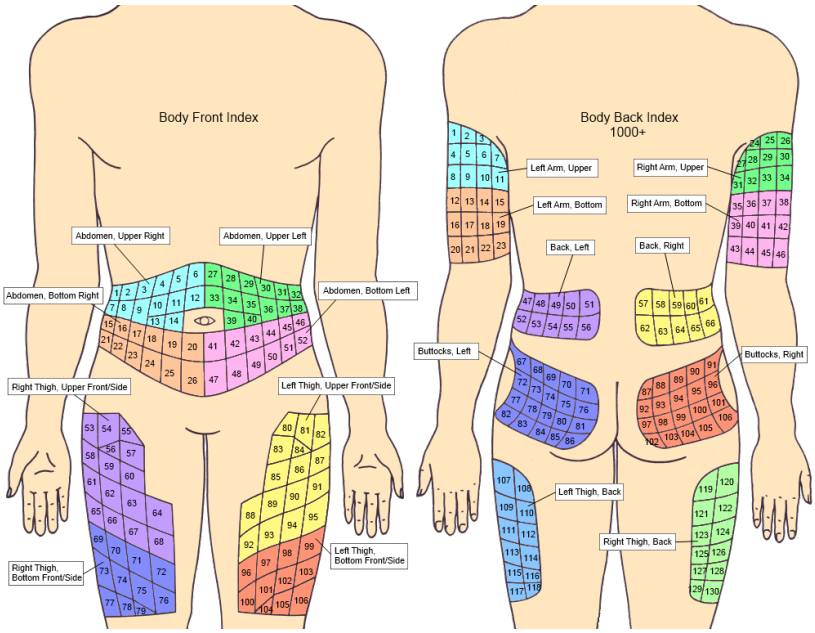
# Site Care: Proper Rotation and Skin Management

## Proper Site Rotation

Rotating infusion sites and pods is critical to the successful use of an insulin pump.

**To avoid complications:**

*Adapted from: https://fit4diabetes.com/fit-tools/*




- Avoid the following areas**:**
  - moles
  - scar tissue
  - bruises
  - tattoos
  - stretch marks
  - bendy areas where the skin creases with bending, like the waistline
  - overused sites
- If you require assistance to insert your infusion site or pod into areas like the back of the arms or lower back, book an appointment with your diabetes educator. Bring your support person, and we will provide hands-on training.

## Managing Skin Sensitivity and Irritation

A small percentage of people experience sensitivity or allergic reactions to parts of the insulin infusion system, such as the cannula, stainless-steel needle, adhesive, or even insulin itself.

- **Symptoms to watch for** → itchiness, swelling, redness, or rash.
- **Irritation during removal** → adhesive removal may cause discomfort or skin irritation. Specific products can help (*see below*).

## Products to Prevent Skin Irritation Under the Infusion Site or Pod.

- **Barrier Wipes and Sprays:**
  - Skin Prep™, IV Prep™, ConvaTec AllKare®: create an invisible protective barrier film when dry.

- 3M Cavilon™ Wipes or Spray: Sting-free, waterproof, protective barrier film.
- Liquid Bandage: Apply with a Q-tip for a protective barrier.
- Hollister Skin Gel Protective Wipes: Provides an invisible barrier and reduces adhesive removal irritation.


- **Specialized Adhesive Barriers:**
  - Torbot Skin Tac™: Hypoallergenic, latex-free, tacky skin barrier which also helps secure the site.
  - 3M Tegaderm™ or IV 3000: Waterproof, clear dressings that act as a barrier between skin and the infusion site. They can also be applied over the infusion site or pod to secure the site.

### Products to help infusion sites or pods stick:

- Torbot Skin Tac™: Wipe or liquid; hypoallergenic and dries tacky to improve adherence.
- Delasco Mastasol®: Strong liquid adhesive ("crazy glue" for skin).


If using these products, use an adhesive remover to avoid skin irritation or damage during removal.

### Products to assist with safe infusion site or pod removal:

- Baby Oil or Baby Oil Gel: Softens adhesive; apply around the tape and gently remove.
- Torbot TacAway™ or Remove (Smith and Nephew): Wipes for gentle adhesive removal.
- Delasco Detachol®: Liquid adhesive remover.

### Products to hold infusion sites or pods in place:

- Retention Tapes:
  - Hypafix® or Mefix Tape®
  - Tuff Grips Retention Tape: Flexible, colorful adhesive shapes for extra security.
- Self-Adherent Wraps:
  - 3M Coban™: Lightweight, comfortable.

- Hockey Tape: available in a variety of colors.

- Bands:
  - Arm, leg, thigh, and stomach bands. Washable, fabric options available online.

- Kinesiology Tape:
  - KT Tape™ or Rock Tape: Latex-free, water-resistant, and sweat-proof. Available in most sporting goods stores in various colors.

## Additional information and products can be found at:

https://www.pantherprogram.org/skin-solutions
www.grifgrips.com
https://pimpmydiabetes.com/
https://diabetesexpress.ca/
https://www.medtronicdiabetes.com/customer-support/insertion-site-management/tape-suggestions
https://pumppeelz.com/pages/about-us

# Infusion Site Insertion Tips for Parents and Caregivers

Insertion of an infusion site or pod may cause slight discomfort, especially for children. It is important to create a predictable routine to foster a sense of safety and trust for your child. These tips can help reduce anxiety, build confidence, and make the injection routine more engaging for young children:

## Preparing for Insertion

- **Let them help**: Involve your child in the preparation process, such as getting the supplies, removing current infusion sites/pods, choosing the new site, cleaning the site. Ask them if they would like to put colourful tapes on their infusion site or decorate their pod.
- **Use pretend play**: Pretend a favorite stuffed animal or doll has diabetes and let your child put an infusion site or pod on them. Ensure there is no needle to avoid accidental poking.
- **Prepare out of sight:** Some children do better when they do not see anything. Set up the infusion site or pod where your child cannot see it to reduce anxiety.
- **Stay calm and matter of fact:** Be firm and confident. Approach your child in a neutral tone, simply stating that it's time to change the pump site.
- **Avoid bribes or negotiations**: change the infusion site/pod quickly and confidently without bargaining.
- **Offer some choices**: Allow your child to choose between two or three pump site areas to give them a sense of control. For example, "Would you like your pump site/pod in your abdomen, thigh, or buttocks?"
- **Keep them distracted**: Distract your child during the site change with activities like watching TV, playing with a device, wiggling their toes, counting aloud, practicing the alphabet, blowing bubbles, or searching for objects in a picture.

## Numbing the Area

- **Emla™ Cream:**
  - Apply to the area to numb the skin.

    - Once numb, remove the cream with an alcohol wipe; otherwise, the infusion site or pod will not stick properly.

- **Ice Pack:**
    - Apply briefly to numb the area before insertion.
    - Ensure the skin is completely dry before proceeding to improve adhesion.

### After the Infusion Site or pod Change:

- Provide lots of hugs, kisses, and praise to reassure your child and build a positive experience around the process.
- Create a Reward System: Use a sticker chart to encourage your child to stay still during pump site/pod changes, celebrating their efforts.

## Wearing Your Insulin Pump

There are countless ways to wear your insulin pump discreetly and comfortably. Explore your pump company's website and other online resources for ideas.

### Creative Ways to Wear Your Pump

Your choice of how and where to wear your pump can depend on many things including: age, outfit, activity and the situation.

**Important:** Infusion sites or pods should never be worn on the beltline. Restrictive clothing may cause "No Delivery" or "Occlusion" alarms due to pressure interrupting insulin delivery.

### Popular Options for Pump Placement

- **Fanny Pack or Spibelt™:** Perfect for young children, lightweight and keeps the pump secure and out of reach. Great for carrying a pump and other supplies as needed such as meter, lancet, fast-acting sugar and snacks. Check running or sports stores for options.

- **Arm Running Band:** Anchor your pump to your arm for secure placement. Great option during activity.

- **While Sleeping**:
  - Place the pump under your pillow.
  - Let the pump "roam free" in bed. Ensure your infusion site is secure to avoid accidental dislodgement.

- **In Socks or Boots:** Thread tubing down your pant leg and tuck the pump into a high sock or boot.

- **Waistband or Cell Phone Case**: Wrap tubing around the pump and clip it to your waistband like a cell phone. Alternatively, use a cell phone case for discreet wear. Wearing a dress - clip it to the back of your dress or under your arm.

- **In Your Bra**: Tuck the pump into a bra or under the bra strap. Use a small baby sock to minimize sweat.

- **Built in pockets:** Many sporty/running brands have shorts, leggings, skirts and dresses that have pockets built in such as Lululemon™, Roots™ and Aerie™.

## Tips from Pump Users

- **Insurance protection**: Contact your home insurance company to add the value of your pump to your policy.

- **Rechargeable pumps**: Always carry a charging cable or leave one in commonly used places, like your car, to prevent low battery issues.

- **Emergency supplies**: Carry extra infusion sets, pods, batteries, and a coin to open the pump's battery compartment.

- **Backup insulin:** Always have insulin, an insulin pen, and pen tips with you, even for short trips.

## Wearing your Pump Around Water

Many insulin pumps are designed to be waterproof or water-tight, but it is important to check your pump's specifications:

**Omnipod:** Waterproof to 25 feet for up to 60 minutes**.**

**Medtronic 780G:** Waterproof to 12 feet for up to 24 hours**.**

**Tandem:** Water-tight to 3 feet for up to 30 minutes**.**

**YpsoPump**: Waterproof to 3 feet up to 60 minutes.

### Considerations for activities around water:

- How long will you be in the water?
- Will you risk losing a tubed pump during water sports (e.g., water skiing or tubing)?
- Are there any cracks in the pump that might void your warranty?
    - Always check with your pump company for specific guidance to avoid warranty issues.

**Tip:** Pumps may be removed for short periods of time while swimming. See Temporary Pump Removal *below.*

## Temporary Pump Removal (Less than 24 Hours)

In certain situations, you may need or want to remove your infusion site/pod for a short period (e.g., beach day, diagnostic procedure, pump malfunction, or running out of supplies). Typically, you can be off your pump for **2-3 hours** without a significant rise in blood sugar.

If you do not put a new infusion site/pod on in the next 3-4 hours, you **must** give insulin by pen injection in order to prevent high blood sugars, ketones and DKA.

### How to safely go off your pump:

You must replace both basal and bolus insulin to safely go off your pump and manage your blood sugars.

Give insulin by pen injection for: missed basal, food and correction in a single injection of rapid-acting insulin every 3-4 hours.

Follow the steps below to determine how much insulin to give every 3 to 4 hours.

### Step 1: Calculate the missed basal:

- Locate your hourly basal rate from your pump. You can find this in your pump settings or through a pump upload.
- Multiply this by 3-4 to determine the amount of basal you will miss over the next 3-4 hours. This is called your missed basal dose.
- Give this as rapid-acting insulin every 3-4 hours, **including overnight.** If you do not give insulin overnight, you are at high risk for ketones and DKA.

### Step 2: Determine your carb ratio:

- Look at your pump settings or pump upload to determine your carb ratio
- Give insulin for meals and snacks based on your carb ratio.

### Step 3: Determine your insulin sensitivity/correction factor:

- Look at your pump settings or pump upload to determine your insulin sensitivity/correction factor
- Give insulin based on your correction factor with meals/snacks or every 3-4 hours if your blood sugar is above target.

### Step 4: Add it all together

- Combine the missed basal, insulin for food and correction into a single injection of rapid-acting insulin every 3-4 hours.

**Activity**: if you will be more active when off your pump, consider giving less insulin.

**REMEMBER**: If you plan to be off your pump overnight, you must give missed basal and correction doses every 3-4 hours overnight by pen injection. If you do not, you are at high risk for ketones and DKA.

**IMPORTANT NOTE:** If you disconnect from your pump but keep your infusion site on, you could reconnect to your infusion site every 2 hours and deliver a bolus for correction and/or food instead of giving an injection by pen.

## Example Scenario:

Mary is going to spend the day at the beach. She will come off her pump for the day. She boluses for breakfast, and removes her infusion site at 9:00 a.m.

At 12:00 p.m. Mary's blood sugar is 12mmol/L, she plans to eat 40 grams of carb for lunch. Mary will continue to be off her pump for the next 4 hours.

- Pump basal rate from 12:00 p.m. – 4:00 p.m. is 0.80 u/hr.
- carb ratio = 10
- correction factor = 2
- target = 6 mmol/L

_____

Calculations:

- Missed Basal: 0.80 x 4 hours = 3.2 units
- Food bolus: 40 ÷ 10 = 4 units
- Correction bolus: 12 – 6 = 6 ÷ 2 = 3 units
- **Total**: 3.2 + 4 + 3 = 10.2 units.

Mary gives 10 units by pen at 12:00 p.m. to cover missed basal, food and correction.

Mary will need to give her next dose at 4:00 p.m., if she is still off her pump.

### Preparation for Temporary Pump Removal

Ask your diabetes educator for help planning temporary pump removal including a bolus calculator sheet which can also help with calculating the insulin for food and correction.

Refer to Appendix 4 for a worksheet to help you calculate doses.

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## Taking a Pump Break for More than 24 Hours

You may decide to take a break from your pump for more than 24 hours for events such as beach vacations, hospitalization, or running out of supplies.

If you decide to take a break from your pump for **more than 24 hours,** you need to:

1. Resume **long-acting insulin** (e.g., Lantus®, Basaglar®, Toujeo®, Tresiba®) to meet your basal insulin needs.
2. Use **rapid-acting insulin** for meals and correction doses. See appendix 2 and 3 for how to calculate doses using a carb ratio and correction.

### How to start long-acting insulin

1. Locate your **total daily basal dose** from your pump, you can find this under the "daily totals," "history," "basal menu" or through a pump upload. If you need help, check your pump manual or contact your pump's technical support team.
2. Give the total basal amount as a **once-daily dose of long-acting insulin** at the same time each day.
    - For Example: If your total basal dose is 20 units, take **20 units of long-acting insulin** every 24 hours at around the same time.

### How do I know how much rapid-acting insulin to give by pen injection?

Locate your carb ratio, correction factor and target in the settings menu of your pump or through a pump upload. You may have settings for different times of the day. Locate the settings that correspond best to your usual mealtime.

Refer to appendix 2 and 3 for how to calculate rapid-acting insulin doses.

### Important considerations during a pump break:

- **Frequent monitoring:** Check blood sugar regularly to ensure doses are effective. Your doses on injections may not be the same as on a pump. Contact your diabetes educator if you need help making dose adjustments.

- **Activity:** you may require extra snacks or less rapid-acting insulin for meals or corrections if you are more active.

- **Insulin stability:** insulin is stable at room temperature for **1 month**.

- **Always carry supplies:** Keep an **insulin pen, pen tips, and rapid-acting insulin** with you at all times.

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## Restarting Your Insulin Pump After Long-Acting Insulin

To safely transition back to your insulin pump after using long-acting insulin, follow these steps:

### Ideal timing to restart your pump:

- Restart your pump when your long-acting insulin has finished working.
- **Example:** If you took your long-acting dose at 8:00 a.m., wait until 8:00 a.m. the next day to restart your pump.

**Do not take long-acting insulin while your pump is running.**

## Restarting Your Pump Before Long-Acting Insulin is Finished

There is a significant risk of a very low blood sugar if you restart the pump while the long-acting insulin is still active and working in your body.

If you need to restart the pump **before the long-acting insulin has finished working**, follow these strategies to reduce the risk of a severe low blood sugar.

**Using Toujeo® or Tresiba®:** the action of these insulins tend to linger in your body longer than 24 hours. You may need to adjust settings for up to 3 to 5 days.

***Example Scenario:***

- Jim takes 12 units of Basaglar at 8:00 a.m.
- He chooses to restart his pump at 8:00 p.m. the same day. The Basaglar dose is still working in the background for the next 12 hours until 8 a.m. the following day.
- To avoid a low blood sugar while the Basaglar is still working and he is getting basal insulin from the pump, Jim will follow the suggestions below.

**Automated Insulin Pumps**: The algorithm alone may not be enough to reduce the chance of a low blood sugar with the long-acting insulin in you/your child's body. Use the strategies below to prevent low blood sugars.

<u>Tandem pump</u>

1. Start exercise activity **AND**
2. Create a new profile which has less basal, a less aggressive carb ratio and correction factor.
    - Create a new profile – name it "less insulin"
    - Create a setting at 12 a.m. as follows:
        - half the basal rate, for example, change 1.0 unit to 0.5 unit
        - double the correction factor for example, change 2 to 4
        - double the carb ratio for example, change from 10 to 20
    - If you have more than 2 lows in 24 hours, adjust the settings again by:
        - half the basal rate, for example, change 0.5 units to 0.25 units
        - double the correction factor for example, change 4 to 8
        - double the carb ratio for example, change from 20 to 40
3. Go back to your usual profile **and** turn exercise activity off when:
    - It has been at least 24 hours since the long-acting insulin was given

- Blood sugars are stable with no more than 1 low in the past 24 hours

4. Not using automation:
    - Set a temp basal rate of 10%
    - Duration: keep the temp basal rate on until it has been at least 24 hours since the long acting was given

**Refer to the pump manual or call Tandem tech support for help setting up a new profile.*

<u>Medtronic pump</u>

1. If you continued to wear your sensor while off your pump:
    - Start SmartGuard™ and temp target. Note: this is only possible if you have 72 hours of sensor wear.
2. If you restart your sensor and pump at the same time:
    - Set suspend before low at 4.5
    - Set a temp basal rate of 10%
3. Not using automation:
    - Set a temp basal rate of 10%
4. Duration: keep the temp target or temp basal rate on until:
    - It has been at least 24 hours since the long-acting insulin was given
    - Blood sugars are stable with no more than 1 low in the past 24 hours

<u>Omnipod 5</u>

1. Start activity
2. Duration: continue to use activity until:
    - It has been at least 24 hours since the long-acting insulin was given
    - Blood sugars are stable with no more than 1 low in the past 24 hours
3. Not using automation:
    - Set a temp basal rate of -90%
    - Duration: keep the temp basal rate on until it has been at least 24 hours since the long-acting insulin was given

<u>Ypso pump with CamAPS fx app</u>:

1. Start Ease off mode
2. Duration: continue to use Ease off until:
    - It has been at least 24 hours since the long-acting insulin was given

- Blood sugars are stable with no more than 1 low in the past 24 hours

3. Not using automation:
    - Set a temp basal rate of 10%
    - Duration:  keep the temp basal rate on until it has been at least 24 hours since the long-acting insulin was given

## Preparation for pump break

- Ensure you have the supplies for a pump break.
- Do you have long-acting insulin?  If not, ask for a prescription.
- Do you have pen tips to give your rapid-acting insulin?

Ask your diabetes educator for help planning for a pump break.  Your diabetes educator can also give you a bolus calculator sheet to help with calculating the insulin for food and correction. Refer to Appendix 2-3 for a worksheet to help you calculate doses.

## Preparing for Travel

Good news - traveling with an insulin pump is easier than injections! When crossing time zones, all you need to do is change the time in your pump and your settings will automatically sync up to the new time zone.

**DO NOT FORGET TO CHANGE IT BACK WHEN YOU GET HOME FROM VACATION.**

### Tips on How to Prepare Before You Go:

1. **Request a loaner pump from the pump company**
   Contact your pump company and request a loaner pump to be used in case your pump malfunctions while traveling. Most companies require at least two weeks' notice to send a loaner pump.

   Ask if a replacement pump can be shipped to your destination country and if there's a different tech support number outside Canada.

   **Bring a copy of your current settings:**
   You need a copy of your settings to program your loaner pump if your pump malfunctions. Upload, save, print or take a picture of your pump settings for reference.

2. **Obtain a travel letter:**
   - Request a letter from your diabetes educator which permits you to carry essential supplies on the plane, such as your blood glucose meter, ketone meter, lancets, pen tips, pump supplies, glucagon, sensor supplies, etc.

3. **Carry prescriptions and labels:**
   - Bring a copy of your insulin and test strip prescriptions. Some countries, like the USA, accept Canadian prescriptions.
   - Ensure your insulin has the pharmaceutical label attached (e.g., on the box) and carry it in its original packaging.

4. **Extra supplies:**
   - Bring double the amount of insulin you think you will need

- Some people bring long-acting insulin with them as an additional back up in case their pump and the loaner pump do not work. Refer to pump break for how to calculate this.

5. **Pack insulin properly:**
   - Use an insulated container to keep your insulin cool during travel. Frio® packs are reusable and convenient for this purpose.
   - Always carry rapid-acting insulin, insulin pens, and other key supplies with you. Never check your insulin or pump supplies. The luggage compartment in planes is not temperature controlled, and you do not want to risk losing your insulin and pump supplies.
   - Medical equipment does not count toward your carry-on bag limit as per Transport Canada.

### Airport Tips

- **Tubed pumps (Medtronic, Tandem, YpsoPump):**
  - Do not put your pump through the conveyor belt scanner/x-ray with your carry-on luggage.
  - Remove your pump if going through a body scanner and have someone hold it.
- **Tubeless pump (Omnipod):** Safe to go through the conveyor belt scanner/x-ray and body scanner.

*All insulin pumps and devices (sensors) can safely go through metal detectors.

### Temperature Considerations

Insulin, pumps and tubing DO NOT like to be exposed to extreme temperatures.

| Extreme Cold | Hot Environments |
|---|---|
| • Tubed Pumps (Medtronic, Tandem, YpsoPump): Ensure tubing is not exposed to cold weather, as insulin can freeze.<br>• Tubeless Pumps (Omnipod): Pods are insulated against cold when worn on the body. | • Tubed pumps (Medtronic, Tandem, YpsoPump): disconnect from your infusion site while in the hot tub or sauna<br>• Tubeless Pump (Omnipod): place the pod on your arm and rest it on the rim of the hot tub to avoid overheating. |

## Diabetes Supplies Checklist

***Use this checklist to ensure you're prepared:***

- ❑ Hard copy or picture of current pump settings. If something happens with your pump, you will not be able to retrieve the settings out of it to program your loaner pump.
- ❑ Back-up loaner pump
- ❑ Pump supplies: Infusion sets, reservoir/cartridges, or pods (double what you think you need)
- ❑ Insulin (both rapid-acting and long-acting)
- ❑ Insulin pens and pen tips
- ❑ CGM sensors (if applicable)
- ❑ Blood glucose monitor and test strips
- ❑ Lancing device and lancets (finger poker)
- ❑ Ketone meter and test strips
- ❑ Medical alert identification (e.g., bracelet)
- ❑ Extra batteries/charging cables for pump, meter, and sensor
- ❑ Extra battery cap for the pump
- ❑ Sharps container (or an empty water bottle)
- ❑ Skin prep dressings or adhesive supplies
- ❑ Emergency contact numbers
- ❑ Low treatment supplies: fast-acting sugar, glucagon, or nasal glucagon, snacks
- ❑ Any additional medications (e.g., Gravol®)
- ❑ Sunscreen
- ❑ Travel letter

### Additional Notes:

- Monitor blood sugar frequently.
- Travel often brings either increased or decreased activity, which can impact blood sugar levels.
- You may need to adjust your insulin settings and/or doses.

## Insulin Pump Funding

The Assistive Devices Program (ADP) in Ontario provides financial assistance for insulin pumps and supplies (infusion sets or pods), making pump therapy more accessible.

### Key ADP Benefits:

**Pump Cost Coverage:**

- ADP covers 100% of the cost of the insulin pump, paid directly to the supplier on your behalf.

**Supply Grant:**

- ADP provides an annual grant of $2,400, paid in four installments of $600.
- The first $600 payment typically arrives 8-12 weeks after starting on the pump.
- The grant covers 65-80% of the cost of monthly supplies, depending on your pump and infusion set.
- Most people pay $50-$100 out of pocket per month for supplies.

**Insurance Investigation:**

- Contact the pump company if you need assistance in investigating if additional insurance coverage is available for your supplies.

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## Understanding the Assistive Devices Program

**1. Upfront costs:**

- You must cover the cost of supplies upfront until the ADP grant payments begin.

**2. Receipts for audits:**

- Keep original receipts for monthly supplies for up to two years in case of an ADP audit.

**3. Eligibility for ongoing funding:**

- To maintain eligibility for the $600 quarterly grant, you must meet the Government of Ontario's medical criteria, reassessed annually.

DO NOT FORGET: A renewal letter will be sent directly to you every year. Contact your diabetes educator when you get the renewal letter to review your ongoing eligibility for supply funding.

## Eligibility Criteria for Children and Youth (18 Years and Younger)

To qualify for continued funding, the following criteria must be met:

- Sick day management: No more than one episode of DKA in the past six months.
- Blood sugar monitoring: Use a sensor or check blood sugar before meals and at bedtime.
- Site care: Change infusion sets at least every 2 – 3 days and rotate sites to maintain healthy insertion sites.
- Effective pump management: Consistently demonstrate effective pump use.
- Clinic visits: Attend at least three clinic visits within the last 12 months.

## Eligibility Criteria for Adults (19 Years and Older)

To qualify for continued funding, adults must meet the following criteria:

- Blood sugar monitoring: Use a sensor or check blood sugar before meals and at bedtime
- Sick day management: Demonstrate successful sick day management practices.
- Regular follow-up:
  - Attend regular appointments with diabetes educators at the Best Centre at least every six months.
  - Follow additional directions from your physician.

## What If I Change My Mind About Pump Therapy?

- You have 90 days to decide if pump therapy is right for you.
- If you experience issues, speak with a diabetes educator to troubleshoot concerns before discontinuing.
- If you choose to stop pump therapy:
    - Notify the pump company to arrange return shipping of the pump.
    - Inform ADP that you have discontinued pump therapy.

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# Technical Support

All insulin pumps come with a warranty from the pump company. If your pump malfunctions or is damaged (e.g., dropped or broken), contact the pump company directly. Most companies will replace your pump under warranty.

### Pump Warranty and Support Information

**Medtronic Diabetes**

- Warranty: 4-year warranty with a Continuation of Therapy Program:
    - If your pump malfunctions after the warranty expires, Medtronic will provide a loaner pump at no cost until you qualify for a new pump through ADP or insurance.
- Website: Medtronic Diabetes Canada: https://www.medtronicdiabetes.ca
- Order Desk/Customer Care:
    - Phone: 1-800-284-4416
    - Email: medtronicdiabetescc@medtronic.com
- 24-Hour Technical Support:
    - Phone: 1-800-MINIMED (646-4633)

**Omnipod Canada**

- Warranty: 5-year warranty on the Controller.
- Website: Omnipod Canada: https://www.omnipod.com/en-ca
- Customer Care/24-Hour Technical Support:
    - Phone: 1-855-763-4636

**Tandem Diabetes Care**

- Warranty: 5-year warranty on the pump.
- Website: Tandem Diabetes Canada: https://www.tandemdiabetes.ca
- Customer Care/24-Hour Technical Support:
  - Phone: 1-833-509-3598

**Ypso Pump**

- Warranty: 5-year warranty on the pump.
- Website: https://www.mylife-diabetescare.com/en-CA/
- Customer Care/24-Hour Technical Support
  - Phone: 1-833-695-5959

## What Supplies do I need?

It is your responsibility to ensure you have enough pump supplies. The pump company will send you enough supplies to get you started, this will last 1-2 months, it is important to place an order within the next few weeks.

**Tubed Pumps:**

You need:

- Reservoir/cartridge
- Infusion set which includes an infusion site and tubing

Infusion sites come with different cannula lengths and types, angles of insertion, and tubing length. Be sure to order the right product.

**Tubeless Pumps**:

You need:

- Pods

**Payment and Funding Timeline**

- Supplies must be paid for out of pocket until you receive your ADP grant funding.
- ADP funding typically arrives within 8-12 weeks after starting on the pump.

### Where to Order Supplies

1. Your Pharmacy:
   - Most pharmacies can stock pump supplies if requested.

2. Online Pharmacy:
   - Diabetes Express:
     - Phone: 1-866-418-3392
     - Website: Diabetes Express: https://diabetesexpress.ca

   - Diabetes Depot:
     - Phone: 1-888-678-8887
     - Website: Diabetes Depot: https://diabetesdepot.ca

   - Endor:
     - Phone: 905-291-7970
     - Website: Endor Health: https://endorhealth.com

3. Pump Companies Directly:
   - Medtronic Diabetes:
     - Website: Medtronic Diabetes: https://www.medtronicdiabetes.ca/
     - Order Desk/Customer Care: 1-800-284-4416
     - Email: medtronicdiabetescc@medtronic.com

   - Ypso Pump:
     - Orders can be made online on their website at: https://www.mylife-diabetescare.com/en-CA/services/ypsopump-insulin-pump-supplies-and-accessories.html
     - Customer Care Team: 1-833-695-5959

   - Tandem Pump:
     - Supplies cannot be ordered directly from tandem, choose one of the options above

   - Omnipod Pump:
     - Supplies must be ordered through diabetes express, see details above

## Preparing for Insulin Pump Start Day

Starting insulin pump therapy is an exciting milestone, and it is normal to feel nervous. To ensure a smooth transition, proper preparation is essential.

### Attention Parents:

- It is highly recommended to take the day off work and remove your child from school on pump start day.
- If you must work, ensure a caregiver attends Pump School with your child (depending on your child's age).

### Plan for Success:

- Dedicate time to learn this new skill, especially in the first few days.
- Avoid starting pump therapy during busy or disrupted schedules (e.g., vacations, camps, final exams).

### Preparation Tips: *PRACTICE, PRACTICE, PRACTICE*

- Take the pump out of its box, insert the batteries or charge it, set the time and date, and open the manual.
- Practice navigating the pump's functions before training.
- You will not break the pump.  Play with it to increase your comfort with this new technology.
- See "Training Resources for Specific Pumps" on the next page to build confidence with your new pump.

# Training Resources for Specific Pumps

## Medtronic Pump Users


- Visit: Medtronic Diabetes Canada: https://www.medtronic.com/ca-en/diabetes/home/support/product-support/minimed-780g-training.html
- Use your pump to follow along with the online tutorial.

## Omnipod Pump Users

Omnipod 5 training videos can be found at: https://www.omnipod.com/en-ca/current-podders/omnipod-5-how-to-videos.


These training videos provide helpful information to prepare you for pump start:

- Omnipod 5 system components
- Getting ready to start
- Omnipod 5 System – Controller Setup
- Omnipod 5 System – Pod activation
- Connection to Sensor:  Dexcom G6 OR
- Connection to Sensor: Dexcom G7
- Follow the video tutorials and practice programming settings in your Controller.
  Do not fill or fire your pod yet.

## Tandem Pump Users

Tandem resources can be found on the T: simulator app and tandem website.

T:simulator app: with tool tips enabled, the key features of the pump are highlighted and explained to help you get started.  Additional resources and access to customer service are also available within the app.

Tandem website:  resources and videos are found under support tab at: https://www.tandemdiabetes.com/en-ca/support/resources/documents.
Scroll to the bottom of the page for helpful videos.

These training videos provide helpful information to prepare you for pump start:

1. How to Navigate Your t:slim X2 Insulin Pump: https://www.youtube.com/watch?v=tqnjNOqxk4M
2. How to Set Up Personal Profiles: https://www.youtube.com/watch?v=OpsxpDXGmPo
3. How to Deliver a Bolus: https://www.youtube.com/watch?v=9Gu6h4OiR5E
4. How to Fill a Cartridge: https://www.youtube.com/watch?v=3BRyGcTlZsU
5. Infusion Sets for Beginners: https://www.youtube.com/watch?v=XRYS-GCDN6o


## YpsoPump Users

Ypso pump information can be found on the YpsoPump explorer app and YpsoPump website.


YpsoPump Explorer app: interact with all pump functions through this 360° rotation of the pump. Guided tours provide instructions of pump features such as, delivering a bolus, programming the basal rates, changing the cartridge and changing the infusion set.

YpsoPump website: instructional videos are found in the services tab at: https://www.mylife-diabetescare.com/en-CA/services/instruction-videos.html.

These training videos provide helpful information to prepare you for pump start:

- Putting into operation and unlocking the screen
- Programming basal rate profiles, temporary basal rate function
- Bolus increments and standard bolus
- Changing the cartridge
- Changing the infusion set.

CamAPS Fx app: mobile app compatible with the YpsoPump that automates insulin delivery. Set up your CamAPS Fx account to access the in-app training. You must complete the mandatory sections of the training to proceed with pairing the Cam APS Fx app to your Ypso pump and dexcom sensor.

## What to Bring on Pump Start Day


1. **Insulin Pump and Supplies**
    - Bring the pump, the box it came in, infusion sets, and reservoir/cartridges.

      See page 50 for more information about ordering supplies.

2. **Blood Glucose Monitoring Tools**
    - Blood glucose meter and test strips (even if using a sensor).
    - Ensure your sensor is on and working if you are starting an automated insulin pump.

3. **Rapid-Acting Insulin**
    - Have your insulin ready for pump start day.

### Staying in Contact

- Pump therapy differs from injections, regular communication with your diabetes educators is essential.
- Upload your pump data regularly and attend all scheduled follow-up appointments.
- Ensure you have an appointment booked within 2-4 weeks of pump start day for ongoing support and adjustments.

## Uploading your Insulin Pump Data

Regularly uploading your insulin pump data is essential for optimizing your pump therapy. This allows your diabetes educator to review your blood sugar data and adjust settings for better results.

### Steps for Uploading your Pump Data:

1. Create an online account:
   - Register and create an account for your insulin pump on the manufacturer's website before starting insulin therapy.
   - Refer to Appendix 6 for step-by-step instructions.
2. Upload frequency:
   - During the first few weeks, upload your pump daily to help your diabetes educator fine-tune:
     - Basal rates
     - Carb ratios
     - Insulin sensitivity/correction factors
     - Targets
   - Regular uploads are necessary because insulin doses on a pump often differ from those on injections.
3. Contact your diabetes educator:
   - Email your designated diabetes educator or the Best Centre at bloodsugars@charleshbest.com after each upload.
   - Some pumps automatically upload their data, email your designated diabetes educator regularly to ask them to review this data.
4. Seek technical assistance:
   - If you encounter any issues during the upload process, call the Technical Support number located on the back of your pump.

### Why Regular Uploads are Important

- Optimizing pump therapy typically takes a few weeks even with automated systems. Regular uploads ensure your insulin doses are adjusted to maximize success.
- Communicating with your diabetes educator ensures better outcomes and a smoother transition to pump therapy.

## Tips for Success


Insulin pumps make it easier to take insulin by giving you precise doses that fit your personal needs. Pump therapy can help you manage type 1 diabetes more effectively and reduce the daily stress of diabetes care.

To get all the benefits offered by pump therapy, follow these important tips:

1. **Wear it.** You must wear your pump. You can take off your pump for short period of time, such as showering. You cannot disconnect or take off your pump for many hours at a time without taking insulin by injection or you will end up very sick with high blood sugars and ketones. See temporary pump removal guidelines for information on how to safely go off your pump when needed.

   You must wear your sensor in order to get the benefits of automated insulin delivery. Without your sensor, the algorithm cannot adjust your insulin.

2. **Charge it/battery backup**. Your pump cannot give you insulin if it is not working. Set up a system for charging your pump. For battery powered pumps, always carry a backup battery.

3. **Fill it.** Ensure that you have enough insulin in your pump. This is especially important at bedtime or when you are out of the house. Get into the habit of checking your pump before bed and when you go out so that you do not run into trouble.

4. **REACT to high blood sugars that are not coming down.** Insulin pumps, especially automated insulin pumps, are designed to keep your blood sugar in target. If your blood sugar is going up and staying up for more than 3-4 hours, it is very important to problem solve. It may be something you ate OR there may be a problem with your pump. See troubleshooting high blood sugar for more information.

5. **Listen to alarms.** Pay attention to pump and sensor alarms. Pumps are mechanical devices, they can and do fail, the alarms can notify you of issues before they become too serious.

6. **Use of bolus function.** Insulin pumps, even automated insulin pumps, work better if you enter carbs for meals and snacks into the pump.

There is a lot to learn when starting and using an insulin pump. You will continue to learn more the longer you are on pump therapy and, you will get more comfortable with the various features and options on your pump. Please keep this manual, your pump specific manual AND if you need guidance, connect with your diabetes educator. We are here to help you.

Good luck and take care.

## **Appendix 1:** Treatment guidelines for high blood sugar: how to calculate insulin for ketones and correction

**IMPORTANT NOTE**: Use a blood ketone meter and blood ketone strips to check for ketones.

**Check ketones when:**

- You have unexplained high blood sugars above 14mmol/L that are not coming down with a bolus insulin dose within 3-4 hours
- You vomit: Vomiting is a sign of DKA. Whenever you/your child has nausea and vomiting, always test blood for ketones. Do not assume it is the flu or food poisoning.
- You are sick: illness can cause high blood sugars and insulin resistance, leading to DKA.


**Warning: Never Ignore High Blood Sugars!**

1. **Act immediately**! You need insulin to correct the high blood sugar AND extra insulin to clear the ketones from your body.
2. **Give insulin by pen injection**. See below for how much insulin to give by pen injection.
3. **Replace everything**: infusion site/pod, tubing, reservoir/cartridge and insulin. Change it again, even if you just changed it. Remember, you cannot see what is happening under your skin.

**Seek medical attention immediately if ketones are greater than 3.0 mmol/L and persist or worsen despite insulin injections by pen.**

## How to calculate insulin for ketones and correction

Information needed: (**These settings can be found through a pump upload or in your settings menu).*

Current Blood sugar: _____ Blood ketones: _____

Insulin sensitivity/correction factor: _____ Target blood sugar: _____

Step 1. Determine your TDD: Access your pump's history menu to find the average total daily dose (TDD) for the past 3 days. Refer to your pump user manual or consult your diabetes educator if you need assistance.

TDD: **_____units**

Step 2: Determine Insulin Needed for Ketones. Use the chart to determine how much rapid-acting insulin to give based on blood sugar and ketone levels.

| | UNDER 10 YEARS OF AGE | | OVER 10 YEARS OF AGE / Adults |
|---|---|---|---|
| **Blood ketones** | **Blood sugar 14-20 mmol/L** | **Blood sugar greater than 20 mmol/L** | **Blood sugar greater than 14 mmol/L** |
| **Less than 0.6 mmol/L** | No extra | Give 5% of TDD | Give 10% of TDD |
| **0.6 - 1.4 mmol/L** | Give 5% of TDD | Give 10% of TDD | Give 15% of TDD |
| **1.5 - 3.0 mmol/L** | Give 10% of TDD | Give 15% of TDD | Give 20% of TDD |
| **Greater than 3.0 mmol/L** | Give 15% of TDD | Give 20% of TDD | Give 20% of TDD |

For example: 25-year-old Mabel with a blood sugar of 20mmol/L, blood ketones 1.4 needs 15% TDD.

Rapid-acting insulin needed for ketones: **_____%TDD**

Step 3: Calculate the extra insulin dose for ketones. Use the chart to calculate the extra insulin dose based on the %TDD (above).

| Total Daily Dose (TDD) | 5% of TDD | 10% of TDD | 15% of TDD | 20% of TDD |
|---|---|---|---|---|
| 5 - 15 units | 0.5 unit | 1 unit | 1.5 unit | 2 unit |
| 16 - 25 units | 1 unit | 2 units | 3 units | 4 units |
| 26 - 35 units | 1.5 units | 3 units | 4.5 unit | 6 units |
| 36 - 45 units | 2 units | 4 units | 6 units | 8 units |
| 46 - 55 units | 2.5 units | 5 units | 7.5 units | 10 units |
| 56 - 65 units | 3 units | 6 units | 9 units | 12 units |
| 66 - 75 units | 3.5 units | 7 units | 10.5 units | 14 units |
| 76 - 85 units | 4 units | 8 units | 12 units | 16units |
| 86 - 95 units | 4.5 units | 9 units | 13.5 units | 18 units |
| 96 - 105 units | 5 units | 10 units | 15 units | 20 units |
| 106 - 115units | 5.5 units | 11 units | 16.5 units | 22 units |
| 116 - 125 units | 6 units | 12 units | 18 units | 24 units |

**For example:** Mabel's TDD is 35 units, 15% of TDD is 4.5 units.

Rapid-acting insulin dose needed for ketones: _____**units**

Step 4: Calculate the insulin dose to correct the high blood sugar

| Blood sugar | | Target | | Amount to correct | | Correction factor | | Correction Dose |
|---|---|---|---|---|---|---|---|---|
| mmol/L | - | mmol/L | = | mmol/L | ÷ | | = | units |

**For example:** Mabel's correction factor is 2, target 6, blood sugar 20mmol/L. 20 –6+ 14 ÷ 2 = 7.

Rapid- acting insulin dose needed to correct the high blood sugar:
_____**units**

| | |
|---|---|
| Step 5: Add it up: insulin for ketones and insulin for correction<br>Rapid-acting insulin dose needed for ketones + rapid-acting insulin dose needed to correct the high blood sugar = Total insulin dose needed.<br><br>Give this as one dose by pen injection.<br><br>For example: Mabel needs 4.5 units for ketones + 7 units for correction for a total of 11.5 units. | _____**units** for ketones<br>**+**<br>_____**units** for correction =<br><br>Total units by pen **injection:**<br>_____ |

Step 6: Change your infusion site/pod, tubing, reservoir/cartridge and insulin

Change it, even if you just changed it. Remember, you cannot see what is happening under your skin. If you have ketones, there is something wrong with the pump, infusion site/ pod, tubing or the insulin. Continuing to use the pump to correct a high blood sugar delays treatment of ketones and puts you at risk for serious medical issues requiring hospitalization.

Note: Using Omnipod 5 – go to step 7 BEFORE putting on a new pod.

Step 7: AID (automated insulin delivery) adjustment

*If you are NOT using an automated insulin pump, resume insulin delivery through your new infusion site/pod and go to Step 8.*

If you are using an automated insulin pump, follow the instructions below. Automated insulin pumps are designed to give more insulin when blood sugars are high, however the algorithm does not know that you gave insulin by pen. To prevent a low blood sugar after giving insulin by pen, follow the instructions below, based on your pump.

**Tandem pump**

Deliver an "air bolus" for the total amount of insulin you gave by pen injection. An "air bolus" will update the IOB (insulin on board) so that the algorithm can account for the insulin provided by pen. Then, the algorithm will adjust automated insulin appropriately and safely. To do this:

1. Disconnect the new infusion site from your body.
2. Deliver a manual bolus into a napkin for the total amount of insulin you gave by pen injection.
3. Reconnect your new infusion site to your body.

**Medtronic pump**

1. Turn SmartGuard off for 4 hours.
2. Set a timer and restart SmartGuard in 4 hours to go back into automation.

**Omnipod 5**

Before starting a new pod, deliver an "air bolus" for the total amount of insulin you gave by pen injection using the old pod. This "air bolus" will update the IOB (insulin on board) so that the algorithm can account for the insulin provided by pen. Then, the algorithm will adjust automated insulin appropriately and safely. To do this:

1. Remove your pod. **Do not** deactivate the pod.
2. While the pod is not attached to your skin and still active, deliver a manual bolus into a napkin for the total amount of insulin you gave by pen injection.
3. Deactivate the pod.
4. Put on a new pod. Stay in automated mode.

If you had a pod failure or are out of insulin in the old pod, you will not be able to do an "air bolus" before deactivating the pod. Instead:

1. Switch to Manual Mode for 4 hours
2. Set a timer and restart automated mode in 4 hours to go back into automation.

**Ypso pump with CamAPS fx app:**

1. Turn Auto Mode off for 4 hours.
2. Set a timer and restart Auto Mode in 4 hours to go back into automation.

Step 8: Follow-up

1. Check blood ketones every 2-3 hours. You may need to give more than one dose of insulin to clear ketones.
2. Monitor blood sugar hourly. Check by finger poke if your sensor is reading HI and not giving you a blood sugar number.
3. Continue to correct high blood sugars. Once you have changed your infusion site/pod, tubing, reservoir/cartridge and insulin, you can give correction doses through the pump until your blood sugars start to come into target.
4. Keep hydrated: drink plenty of water or sugar-free fluids. Water alone will not treat ketones. Water along with the extra insulin by pen will help to flush the ketones out in your urine.
5. Rest: never exercise if ketones are above 1.5mmol/L.

**IMPORTANT NOTE:** Monitor blood sugar and blood ketones every 2-3 hours.

## **Appendix 2:** How to calculate insulin dose to correct a high blood sugar by pen

To calculate the insulin dose needed to correct a high blood sugar, you need to know your:

*Insulin sensitivity /correction factor: _____

*Blood sugar target: _____

Current Blood sugar: _____

For example: Frank
Insulin sensitivity factor/correction: ***4***
Blood sugar target: **6**
Current Blood sugar: ***18***

| **Blood sugar** | | **Target** | | **Amount to correct** | | **Correction factor** | | **Correction Dose** |
|---|---|---|---|---|---|---|---|---|
| **18 mmol/L** | **-** | **6 mmol/L** | **=** | **12 mmol/L** | **÷** | 4 | **=** | **3 units** |

Frank needs 3 units to correct his high blood sugar.

Use the chart below to help you calculate the dose.

| **Current Blood sugar** | | **Target** | | **Amount to correct** | | **Correction factor** | | **Correction Dose** |
|---|---|---|---|---|---|---|---|---|
| **mmol/L** | **-** | **mmol/L** | **=** | **mmol/L** | **÷** | | **=** | **units** |

*Note: Multiple insulin sensitivity/correction factors and targets may be programmed into your pump depending on the time of day. Use the ones that correspond best to the time of day you are correcting a high blood sugar by pen injection.

## **Appendix 3:** How to calculate insulin for carbs administered by pen

### Carb Ratio:

- Measure and add up the amount of carbs (in grams) in the meal.
- Divide by the carb ratio

| Grams of carbs | ÷ | Carb Ratio | = | Meal Dose |
|---|---|---|---|---|
| 60 | | 10 | | 6 units |

Example:

- A meal contains 60 grams of carbs. Your carb ratio is 1:10.
- 60 (grams of carbs) divided by 10 (carb ratio) is 6 units.

Note: Multiple carb ratios may be programmed into your pump depending on the time of day. Use the one that corresponds best to the time of day you are eating.

## **Appendix 4:** How to calculate insulin for temporary pump removal less than 24 hours

### Step 1: Calculate the missed basal:

- Determine your hourly basal rate from your pump. You can find this in your pump settings or through a pump upload
- Multiply this by 3-4 to determine the amount of basal you will miss over the next 3-4 hours. This is called your missed basal dose.
- Administer this as rapid-acting insulin every 3-4 hours, **including overnight.** If you do not give insulin overnight, you are at high risk for ketones and DKA.

What is your pump basal rate for the 3-4-hour time frame you will be off your pump?

Pump basal rate from _____ – _____ = _____ u/hr.

### Step 2: Determine your carb ratio:

- Look at your pump settings or pump upload to determine your carb ratio
- Give insulin for meals and snacks based on your carb ratio
- Activity: if you will be more active when off your pump, consider giving less insulin with your meal or snack

What is your carb ratio for the 3-4-hour time frame you will be off your pump?

Your carb ratio: _____

How to calculate the insulin dose based on the carb ratio:

| Grams of carbs | ÷ | Carb Ratio | = | Meal Dose |
|---|---|---|---|---|
| | | | | units |

### Step 3: Determine your insulin sensitivity/correction factor:

- Look at your pump settings or pump upload to determine your insulin sensitivity/correction factor. Use a target blood sugar of 6 mmol/L.

- Give insulin based on your correction factor with meals/snacks or every 3-4 hours if your blood sugar is above target

**Activity:** if you will be more active when off your pump, consider giving less insulin for corrections

What is your correction factor for the 3-4 hour time frame you will be off your pump?

Your insulin sensitivity/correction factor: _____

How to calculate the insulin dose based on the correction factor:

| Current Blood sugar | - | Target | = | Amount to correct | ÷ | Correction factor | = | Correction Dose |
|---|---|---|---|---|---|---|---|---|
| mmol/L | | 6 mmol/L | | mmol/L | | | | units |

## Step 4: Add it all together

- Combine the missed basal, insulin for food and correction into a single injection of rapid-acting insulin by pen injection every 3-4 hours.

| Missed Basal: | + | Insulin for food | + | Insulin for injection | = | Insulin by pen injection every 3-4 hours: |
|---|---|---|---|---|---|---|
| | | | | | | |

Remember, if you plan to be off your pump overnight, you must give missed basal and correction doses every 3-4 hours overnight by pen. If you do not, you are at high risk for ketones and DKA.

## **Appendix 5:** How to upload your insulin pump and sensor

Uploading your pump and sensor data is essential for managing insulin therapy effectively. Based on your pump type, follow the steps below to upload your pump and share your data with the Best Centre.

## Uploading Your Medtronic Pump and Guardian Sensor

### *Option 1: Using the MiniMed Mobile App*

1. Download and Set Up the App:
    - Search for the MiniMed Mobile App in the Google Play Store or Apple App Store and download it.
    - Open the app, select your country. Select “Create account” at the bottom of the screen
    - Log in using your Carelink account credentials.
    - Follow the app instructions to pair your pump to the app using Bluetooth.

2. Upload Pump Data via the App:
    - Open the app and log in.
    - Tap the menu (three lines) in the top left corner and select ‘Sync to Carelink.’
    - Click ‘Upload Now’ to upload your pump data.

### *Option 2: Using a Computer and USB Adapter*

1. Create a Carelink Account:
    - Go to Carelink Minimed EU: https://carelink.minimed.eu
    - Follow the steps to create an account.

2. Install Uploader Software:
    - Log in to your Carelink account and click on ‘How to Install Uploader’ under the ‘Upload Now’ button.
    - Download and install the Carelink Uploader. Restart your computer if required.

3. Upload Pump Data:
    - Connect the Blue Adapter USB to your computer.
    - Log in to Carelink, click 'Upload Now,' and follow the instructions to pair your pump.
    - Clear any active alarms on the pump and ensure the battery is charged.
    - Complete the upload process and click 'Exit.'

## Uploading Your Omnipod Pump using Glooko

### Omnipod 5

Data is uploaded from the Omnipod 5 Controller wirelessly to Glooko.

*Option 1: Using the Glooko App to set up your account*

1. Download and Set Up the App:
    - Search for the Glooko App in the App Store, Glooko mobile app in the google play store, and download it.
    - Open the app and create an account

2. Add Care team
    - From the home screen, tap Add Care Teams
    - Next screen, tap Add care teams at the bottom of the screen
    - Enter proconnect code cbd for Charles H. Best Diabetes Centre
    - Tap Continue
    - Tap Connect

3. Sync your diabetes device
    - From the home screen, tap sync your diabetes device
    - Tap continue, follow prompts on the screen to connect your sensor and omnipod 5
    - You will be taken to the omnipod 5 website to login with your Omnipod ID and connect

*Option 2: Using a Computer to set up your account*

There is no option to physically plug in your controller to upload the data to Glooko.

1. Set Up Your Glooko Account:
   - Visit Glooko: https://join.glooko.com/
   - Use proconnect code cbd for Charles H. Best Diabetes Centre

2. Link Glooko to your omnipod ID
   - Log into your online omnipod account at www.omnipod.com, using your Omnipod ID
   - Go to the My Account tab, select Account Linking from the dropdown menu
   - Select log in with Glooko
   - Proceed to Glooko and complete the process to link your account
   - When complete, your status will update to Linked and data will automatically upload into your personal Glooko account.

## Uploading your Tandem pump using Tandem Source

### *Step 1: Create an account*

Go to: source.tandemdiabetes.com

1. Click on Create an account
2. Select the type of account: personal use or parent/guardian (for a child under 16)
3. Complete the form using the e-mail address you used to register with Tandem. An activation email will be sent to you
4. Check your e-mail to Activate your account by following the instructions
5. Finish creating your account by adding a password.

To share your data with your clinic:

1. Click on the blue circle on the top right corner, then Account Settings
2. Select Share Reports then Add Clinic
3. Choose the province and then enter the name of your clinic
4. Click on Start Sharing.

### *Step 2: Uploading your pump data*

Once you've logged in to your Tandem Source account (and internet)

1. Plug the pump into the computer using the Tandem micro-USB cable

2. Click on Upload pump in the left-hand navigation menu
3. Select Start Upload
4. You may be notified that source.tandemdiabetes.com is trying to connect to a serial port: click on Tandem Virtual COM Port and choose Connect if this is the case.
5. The first time you upload your pump: you must Link your pump by following the on-screen instructions
6. When you see the “View Reports” message, your pump is successfully uploaded.
7. You can access your reports by selecting View Reports.

## Uploading Your mylife Loop (YpsoPump) Data

Data is automatically uploaded from the CamAPS FX app wirelessly to glooko.

1. Create a personal Glooko account
   - Download and Set Up the App: Search for the Glooko mobile app in the google play store, and download it.
   - Open the app and create an account

2. Add Care team
   - From the home screen, tap Add Care Teams
   - Next screen, tap Add care teams at the bottom of the screen
   - Enter proconnect code cbd for Charles H. Best Diabetes Centre
   - Tap Continue
   - Tap Connect, tap Done

3. Connect CamAPS FX app to Glooko
   - From the home screen, select drop down menu (top left)
   - Tap Share
   - Under the Glooko heading, select user 1. Enter Glooko username and password.
   - Tap link

**Glooko support can be found at:**

- Call: 1-800-206-6601
- Text: 650-720-5310
- Email: support@glooko.com
- https://ca.join.glooko.com

## **Appendix 6:** Your insulin pump settings

It is important to keep a record of your most recent pump settings in case your pump malfunctions and the settings cannot be retrieved from the pump.

You may access and save your pump settings via your pump upload or record them below. Make sure to update this record any time your pump settings change:

| Date: | |
|---|---|
| **Basal Rates:** | |
| 12AM : | units |
| : | units per hour |
| : | units per hour |
| : | units per hour |
| : | units per hour |

| | |
|---|---|
| **Insulin Carb Ratio (ICR):** | |
| 12 AM : | |
| : | |
| : | |
| : | |
| : | |

| Date: | |
|---|---|
| **Insulin Sensitivity Factor (ISF) or Correction Factor:** | |
| 12AM : | |
| : | |
| : | |
| : | |
| : | |

| | |
|---|---|
| **Blood Sugar Targets:** | |
| 12 AM : | |
| : | |
| : | |
| : | |
| : | |

Active Insulin Time or Insulin on Board: _____ hours
Maximum Bolus Amount: _____ units
Maximum Basal Rate: _____ units per hour

## **Appendix 7:** Knowledge Check

1. I lost my waterproof pump in the lake while I was wake-boarding. What do I do now?
    a. Buy a new one.
    b. Call the 1-800 number to ask if you can have a loaner pump until you figure out your house insurance claim.
    c. Go to the local pharmacy and obtain pens to give rapid-acting insulin every 4 hours.
    d. Give both long and rapid-acting insulin.

2. I ran out of infusion sets and it's Friday night. What do I do now?
    a. Call the Best Centre.
    b. Call the late-night pharmacy and ask if they have any in stock.
    c. Call the Pump Company to ask if they can ship me some.
    d. Take rapid-acting insulin by pen every 3-4 hours until I can get some tomorrow.

3. My child becomes very anxious on infusion site change day. What should I do?
    a. Insist they watch while I fill the reservoir/cartridge and prime the tubing.
    b. Use an ice pack to numb the area I am going to insert it in.
    c. Leave the infusion site in for 5 days so I don't have to change it as often.
    d. Be matter of fact, no negotiating and prepare the reservoir/cartridge and infusion sets out of sight.

4. My child has been forgetting to bolus at school recently. What should I do?
    a. Tell her to skip lunch.
    b. Set a BG or Bolus Reminder in her pump to alarm at lunch time.
    c. Don't worry, she will grow out of it.
    d. Text every day at lunch to remind her to bolus.
    e. Ask the teacher if she could remind her to bolus.
    f. Contact your diabetes educator

5. What do I do if my pump breaks while on vacation?
    a. Cry.
    b. Use the loaner pump that I brought with me.
    c. Give rapid-acting insulin by pen every 3-4 hours.
    d. Call the pump company.

6. Where should I keep a record of my Pump Settings?
    a. In my chart at the Best Centre.
    b. In my pump.
    c. In my wallet/purse.
    d. On the website where I upload my pump.

7. My pump is alarming, and I think it is broken. What is my next step?
    a. Cry.
    b. Call the Insulin Pump Company.
    c. Check my blood sugar and give rapid-acting insulin by pen every 3-4 hours.
    d. Go to my upload and look at my insulin pump settings to program the new pump.