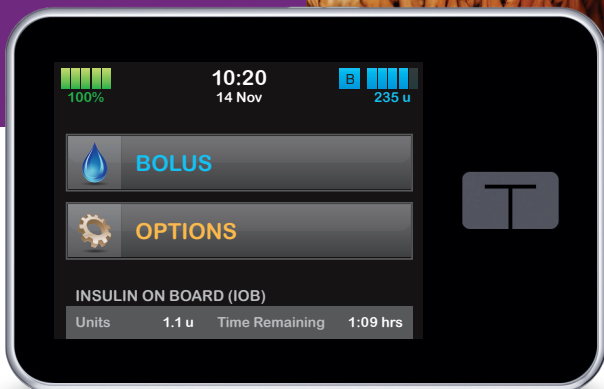




# A Guide to Successful Pumping



This guide is intended for distribution only within Canada.



**TANDEM™**  
DIABETES CARE





# A Guide to Successful Pumping

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## Introduction to Insulin Pump Therapy

### Welcome to insulin pump therapy and a fresh new way to manage your diabetes.

Congratulations on your decision to manage your diabetes with an insulin pump. To help you better understand insulin pump therapy and achieve the most from your Tandem pump, we have created this guide. In it, you will find basic information on insulin pump therapy, carbohydrate counting, troubleshooting, and other helpful resources to assist you in your daily life.

Starting insulin pump therapy is an exciting time. Chances are, you have questions and concerns. We are here to help you every step of the way.

In this chapter you will:

- Get to know your Tandem pump.
- Learn basic concepts and expectations of insulin pump therapy.
- Prepare for your upcoming product training session.

*Note: Do not attempt to start insulin pump therapy without the guidance and support of a healthcare provider. Your current insulin doses will be used to determine the correct insulin pump dose settings for your individual needs. This Guide is not intended to be a substitute for medical care from your healthcare provider. If you have any questions about your diabetes management, please contact your healthcare provider.*

*Consult the Tandem Pump User Guide for indications for use, contraindications, warnings, and precautions. Should you have concerns about your Tandem pump, contact Tandem Diabetes Care Customer Technical Support at (833) 509-3598.*



## Introduction to Insulin Pump Therapy



## Training Tip

Do not load insulin into your Tandem pump until you have completed your training.

## Preparing for Your Pump Training

Once you receive your Tandem pump, your healthcare provider or insulin pump trainer will work with you to make sure you have a good understanding of insulin pump therapy and how to safely and effectively use your Tandem pump. In addition, your healthcare provider will help you customize insulin pump therapy to your individual needs.

The best way to prepare for your initial training is to work through this guide and get to know your Tandem pump. Take it out of the box, read through your user guide, and become familiar with your Tandem pump.

## Training Session Materials

Listed below are items to bring to your training session:

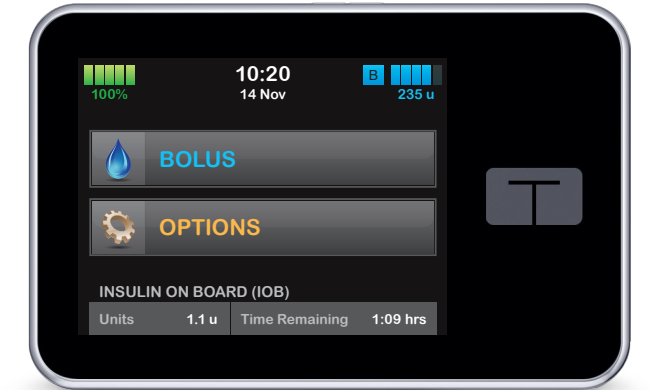
- Room temperature, rapid-acting insulin (or saline, depending on the need)
- Tandem pump
- Micro-USB cable
- Pump cartridges (a minimum of three)
- Infusion sets (a minimum of three)
- Infusion site preparation products (antiseptic wipes, skin adhesive, etc.)
- This Guide to Successful Pumping
- Tandem Pump User Guide
- CGM supplies (if using CGM)
- Glucose testing supplies (meter, strips, lancets, meter batteries, etc.)
- Glucose records
- Fast-acting glucose tablets and snack
- List of questions and concerns

## Getting to Know Your Tandem Pump – Sleek Design and Advanced Functionality

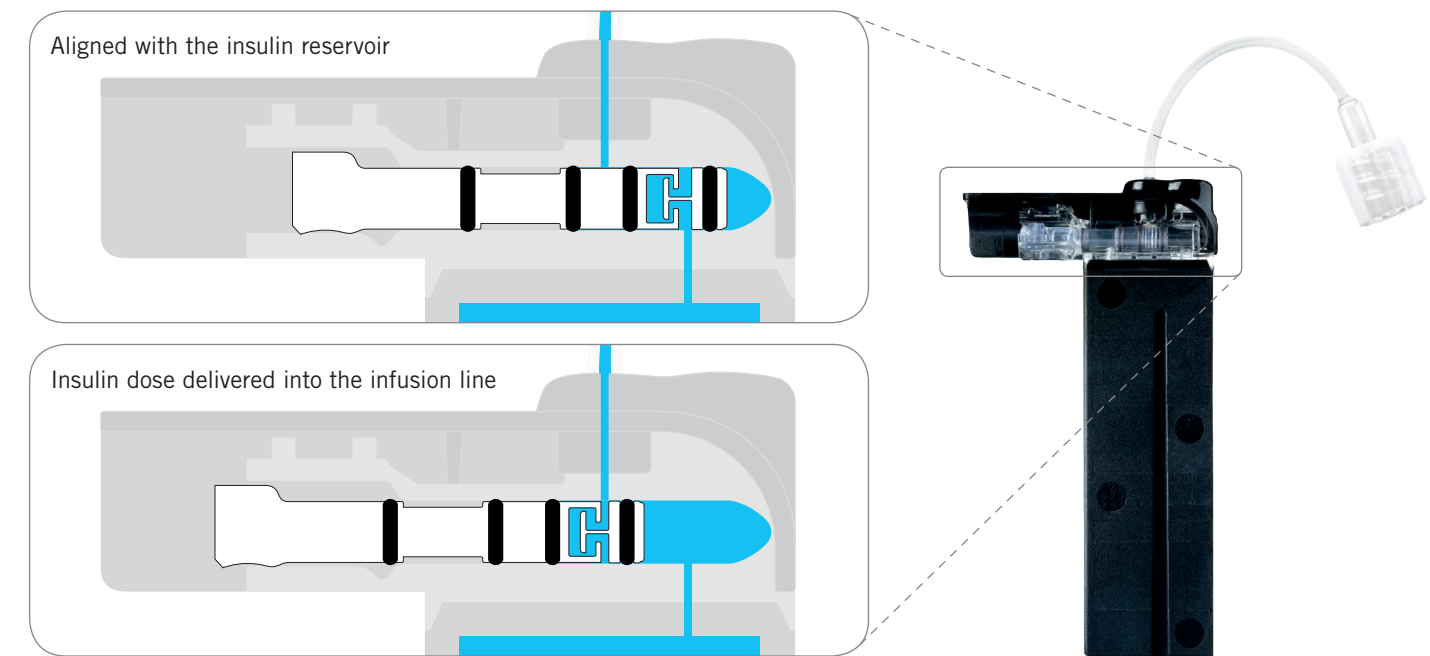
Your Tandem pump is more than just a pretty face. The technology behind the colorful touchscreen offers a wide variety of therapeutic options. Let's take a closer look at the hardware and the software that make up your Tandem pump.

The hardware includes the mechanical “nuts and bolts” of your Tandem pump. It consists of a tiny motor, a cartridge, and a Micro-Delivery® technology chamber. Insulin is moved from the cartridge into the Micro-Delivery chamber, then in very small amounts delivered through a tube and into your body by way of an infusion set.

The software is built into your insulin pump. It is the computer program that tells your Tandem pump how much insulin to deliver based on your insulin dose settings and the information that you enter.



(Tandem Pump, actual size)



Micro-delivery chamber illustration

(Cartridge, actual size)



# Introduction to Insulin Pump Therapy

## Understanding Basic Insulin Pump Therapy Concepts

### Basal Insulin Delivery

Basal insulin, often referred to as background insulin, is the slow, continuous delivery of insulin that keeps your glucose stable between meals and during sleep. The long-acting insulin that was previously taken by injection is replaced with very small doses of rapid-acting insulin delivered on a continuous basis by your Tandem pump.

The basal rate represents the amount of rapid-acting insulin delivered over an hour. As an example, a basal rate of 1.0 means that 1 unit of insulin will be divided into equal increments and delivered every 5 minutes over a period of 1 hour.

There are many advantages that insulin pump basal delivery offers compared to long-acting insulin injections:

- Basal needs vary from person to person. Your Tandem pump can be programmed to release more or less insulin at different times of the day to match your biological needs. For example, if you need more insulin during the early morning, your Tandem pump can be programmed to increase the amount of insulin delivered at that time. During the afternoon, if less insulin is needed, your Tandem pump can be programmed to deliver a smaller amount.
- Unexpected changes in your daily routine. Your basal rate can be modified for unplanned changes like travel, exercise, a trip to the amusement park, or an illness.

### Bolus Insulin Delivery

A bolus is a quick dose of rapid-acting insulin that is delivered to cover food or an elevated glucose. A Food Bolus is taken every time you eat a meal or snack. The Correction Bolus is taken to lower or “correct” high glucose.

There are many advantages that an insulin pump bolus offers over insulin injections:

- You are always covered. You can take a bolus whenever and wherever, even for those small snacks or the occasional dessert.
- Your Tandem pump helps you with your bolus doses. Just enter the grams of carbohydrate you plan to eat and/or your glucose and your Tandem pump will calculate how much insulin you need. It will even keep track of insulin remaining in your body from previous boluses.

- No more routine daily shots. You do not have to take an injection every time you eat. By simply tapping the screen, you can cover every meal or snack with insulin.
- Fine-tune your boluses. Your Tandem pump is able to deliver very small amounts of insulin (calculated to the hundredth of a unit), making it easier to keep your glucose in control. You also have the option of delivering all or part of your Food Bolus over an extended period of time, allowing a better match of insulin for foods that are slower to digest.

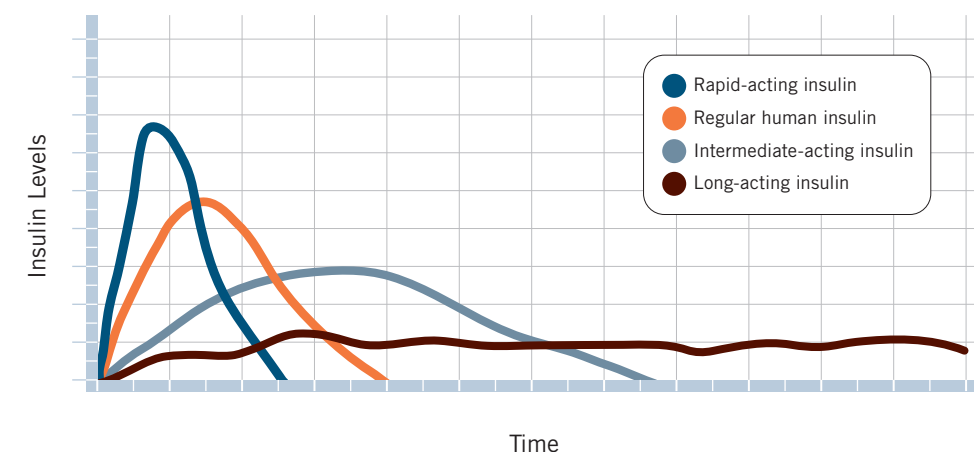
### Rapid-acting Insulin

Rapid-acting insulin is currently the most similar to the natural insulin that your body produces. It has the most rapid onset of any injectable insulin and works more efficiently at lowering your glucose. Though variable, the general characteristics of rapid-acting insulin are:

- Onset – Starts working within 5-10 minutes
- Peak – At its strongest within 1-1.5 hours
- Duration – Clears the body within 3-5 hours

The use of rapid-acting insulin as basal insulin offers added flexibility over long-acting insulin. Once long-acting insulin is injected, it remains active in your body from 12-24 hours, or more. Your Tandem pump releases rapid-acting insulin for basal coverage continuously and can be adjusted as needed. See figure below.

### Activity Profiles of Different Insulins



(Adapted from ADA, 2015)



#### Checkpoint

The slow, steady, continuous delivery of insulin is referred to as:

Answer



#### Checkpoint

When is rapid-acting insulin at its peak?

Answer

# Introduction to Insulin Pump Therapy

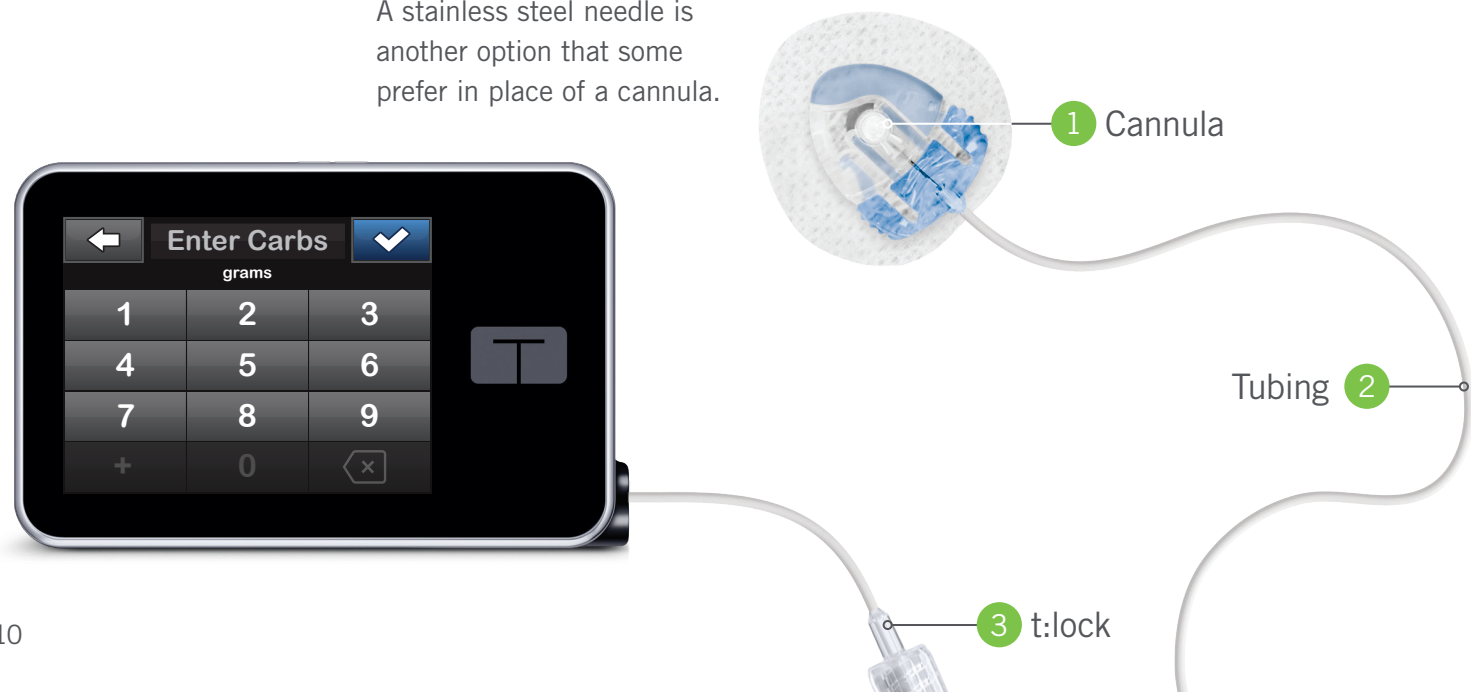
## Learning About Your Insulin Pump Infusion Set and Options

An infusion set consists of a complete tubing system that delivers insulin from your Tandem pump to you. Your healthcare provider or insulin pump trainer will work with you to show you how to insert your infusion set and discuss how to change it out every 2-3 days. An infusion set consists of the following:

- 1 The cannula is a very tiny, soft tube or needle placed by you just under your skin to allow insulin to flow into your body.
- 2 The tubing allows insulin to flow from your insulin pump to you.
- 3 The t:lock™ connector connects and locks the tubing to your insulin pump.

Tubing is available in a variety of lengths, typically 60 inches (23 cm), 80 inches (32 cm), and 110 inches (43 cm). The length you choose will depend on your height, where you wear your Tandem pump (inside or outside of your clothing), how you wear your pump when you sleep, and other factors related to your daily activities and preferences.

Your healthcare provider or insulin pump trainer will show you how to insert the cannula into the fatty (subcutaneous) tissue just below the skin surface. The cannula is inserted either manually or with an insertion device via an introducer needle. Once inserted, the introducer needle is removed and the soft, flexible cannula remains under your skin without causing discomfort with movement. A stainless steel needle is another option that some prefer in place of a cannula.



| Cannula Type    | Description  | Advantages   |
|-----------------|--|--|
| Angled          | Inserted at a 30-45 degree angle. Available in lengths of 13 and 17 mm.  | Stable, less risk of accidental removal. Less likely to bump up against muscle in slender people.                      |
| 90 Degree       | Inserted perpendicular to the skin. Available in lengths of 6 and 9 mm.  | Easy to insert. Has a shorter cannula.   |
| Stainless Steel | No plastic cannula. The needle remains under the skin. Replaced every two days. 90-degree angle. Available in lengths of 6 and 8 mm. | Frequently used by people with allergies to a plastic cannula. Easy to insert. Does not kink; less risk for occlusion. |



### Training Tip

If the infusion site is uncomfortable or if swelling or redness develops, change out your set and notify your healthcare provider or insulin pump trainer. Refer to Chapter 5 for infusion set troubleshooting.

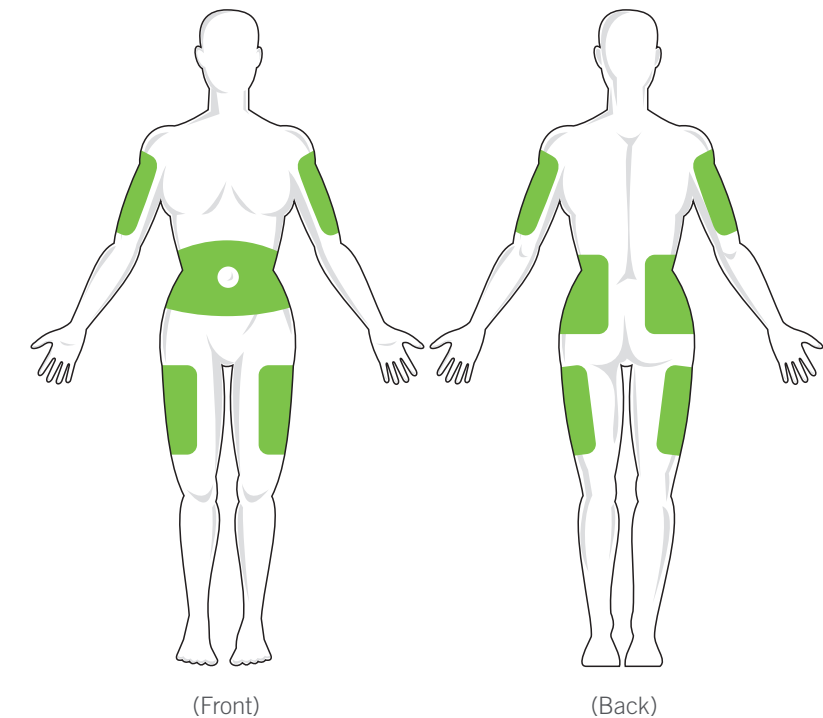
Insertion devices are available to help insert the cannula. These devices are easy to use and a popular option for those who do not want to push the needle in by hand. They are available as a stand-alone insertion device or as part of an all-in-one infusion set. They are typically spring-loaded and are designed to hide the needle from view.

Your healthcare provider or insulin pump trainer will help you determine which infusion set is right for you. Site location preference, your body size, and your activity level will be considered when selecting an infusion set.

### General Guidelines for Infusion Sets

#### Site Selection

- Your infusion set can be worn anywhere on your body where you would normally inject insulin. Absorption may vary from site to site. Discuss these options with your healthcare provider or insulin pump trainer.
- The most commonly used sites are the abdomen, upper buttocks, hips, upper arms, and upper legs.





# Introduction to Insulin Pump Therapy



### Checkpoint

How often should the cannula be replaced and the site rotated?

Answer

- The abdomen is the most popular site because of access to fatty tissue. If using the abdominal area:
  - » **AVOID** any area that would constrict the site, such as the belt line, waistline, or where you would normally bend.
  - » **AVOID** any area 2 inches [5 cm] around your navel.
  - » **AVOID** placing the infusion set directly on scars, moles, stretch marks, or tattoos.

### Site Rotation

- The infusion set must be replaced and rotated every 2-3 days.
- With experience, you will find areas that not only provide better absorption but are more comfortable. Keep in mind, using the same area may cause scarring or lumps, which will affect insulin absorption.
- Establish a rotation schedule that best fits your needs.

### Keep it Clean

- When changing your infusion set, always use clean technique to avoid an infection.
- Wash your hands, use antiseptic wipes or infusion site preparation products, and keep the area clean to avoid contamination.

### Skin Adhesive (Tape, Dressing, Solution)

- Prevents the infusion set from slipping off or being pulled out if your Tandem pump is dropped or tugged.
- Useful when engaging in sports or in a hot climate.
- If needed for additional security, create a safety loop by taping the tubing to your skin about 1–2 inches [2.5–5 cm] from the infusion site.



### Training Tip

A common cause for an occlusion alarm is an infusion set obstruction. The cannula can bend, hit scar tissue, or it may be placed in an area that does not absorb insulin well. When in doubt, change it out! Refer to Chapter 5 for infusion set troubleshooting.

## Setting Realistic Expectations

With insulin pump therapy, it is always helpful to have realistic expectations so you won't be disappointed in your progress. Below are some examples of realistic and unrealistic expectations.

| Realistic Expectations                  | Unrealistic Expectations            |
|---|-------------------------------------|
| Improve my glucose management           | Not think about my diabetes anymore |
| Monitor my glucose more often           | Monitor glucose less often          |
| Review records and evaluate my progress | Let my pump do all the work         |



Make a list of what you would like to accomplish with insulin pump therapy. Discuss these expectations with your healthcare provider.

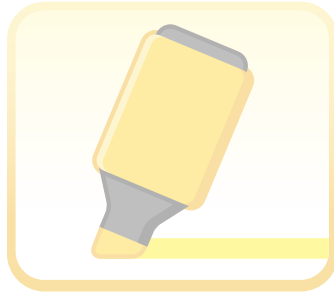
*Example: Learn to count carbs and/or reduce my A1C.*

- 1.
- 2.
- 3.
- 4.
- 5.

Keep in mind that while insulin pump therapy provides a continuous way to deliver insulin, it is not a “cure” for your diabetes. The goal is to manage your glucose levels and minimize wide fluctuations. It does not happen overnight. It may take some time to adjust to insulin pump therapy and fine-tune the insulin dose settings that work best for you. Working closely with your healthcare provider will help you along this process.

*Congratulations! You are off to an exciting start!*

## Introduction to Insulin Pump Therapy



### Chapter Highlights

- Be prepared for your Tandem pump training session by working through this chapter and bringing the necessary items to your session.
- Basal insulin is a slow, continuous delivery of insulin, which keeps glucose levels stable between meals and during sleep. It is measured in units per hour.
- A bolus is a quick dose of insulin that is delivered to cover food eaten or a high glucose. It is measured in units of insulin that is intended to match the amount of carb consumed and/or cover a high glucose.
- You will use rapid-acting insulin in your Tandem pump. Rapid-acting insulin begins working within 5-10 minutes, peaks in 1-1.5 hours, and leaves the body in 3-5 hours.
- An infusion set is a complete tubing system that delivers insulin from your Tandem pump to your body. Work with your healthcare provider or insulin pump trainer to determine which type of infusion set is right for you.
- Establishing realistic expectations for insulin pump therapy in the beginning will help to keep you on track.



### Checkpoint Answers

1. The slow, steady, continuous delivery of insulin is referred to as?  
*Answer: Basal insulin.*
2. When is rapid-acting insulin at its peak?  
*Answer: 1-1.5 hours.*
3. How often should the cannula be replaced and the site rotated?  
*Answer: Every 2-3 days. More frequently, if needed.*



## Customizing Your Insulin Dose Settings

Programming your insulin pump has never been so easy.

To get you started, your healthcare provider will work with you to determine your initial insulin dose settings and help you program them into the Personal Profiles section of your Tandem pump. Your Tandem pump is so smart that its internal software is able to calculate and deliver precise, preprogrammed insulin doses customized specifically for you.

This chapter describes five key insulin dose settings and the role they play in managing your diabetes. They are:

- Basal rate
- Carb ratio (insulin-to-carb ratio)
- Target glucose
- Correction factor (insulin sensitivity)
- Insulin duration (duration of insulin action)



# Customizing Your Insulin Dose Settings

## Understanding Personal Profiles

Your Tandem pump makes programming insulin delivery simple. You can easily program several different insulin dose settings on one easy-to-find screen. Once established, each group of settings is referred to as a Personal Profile.

- A Personal Profile is a group of settings that defines your basal and bolus delivery within specific time segments throughout a 24-hour period.
- Within each time segment, a basal rate, correction factor, carb ratio, and target glucose are set.
- Personal Profiles also include insulin duration, max bolus, and carb settings.

You can program up to six individualized Personal Profiles. Each profile offers customized insulin dose settings (basal rate, correction factor, carb ratio, and target glucose) and can be personalized with a name. Programming different Personal Profiles allows you to customize your insulin dosing to handle the following situations:

- Changes in daily activities (routine exercise or sports)
- Regular changes in work schedule (shift work, alternating work schedule)
- Sick days
- Weekends, summer camp, travel
- Hormonal changes

## Understanding Insulin Dosing Calculations

If you are new to pumping, your healthcare provider will determine your initial insulin dose settings based on your personal history and standard formulas. These formulas are influenced by a variety of clinical factors such as your body weight, glucose levels, and your current insulin regimen. Understanding the “math” behind insulin dosing can be overwhelming for some. To help you along, we have provided formulas and activities to ensure that you have a clear understanding of how your Tandem pump calculates insulin doses.



## Understanding Basal Rate Settings

As presented in Chapter 1, basal insulin is the slow, continuous delivery of insulin that keeps your glucose stable between meals and during sleep. When set accurately, the basal rate should keep your glucose stable overnight and throughout the day, even if you skip a meal. However, our body's demand for insulin is individualized and may vary throughout a 24-hour period. Your Tandem pump can be programmed with a basal pattern that is customized to suit these needs.

As you begin insulin pump therapy, it is typical to start with only one or two basal rates over a 24-hour period. Additional basal rates may be added, and current basal rates may be changed as you adjust to pump therapy and evaluate your glucose control.

The basal rate setting in your Tandem pump always starts at 12:00 AM (midnight). Insulin will be delivered at the first rate until the next time segment is entered and a new rate is started. Below are two examples of basal rate settings.

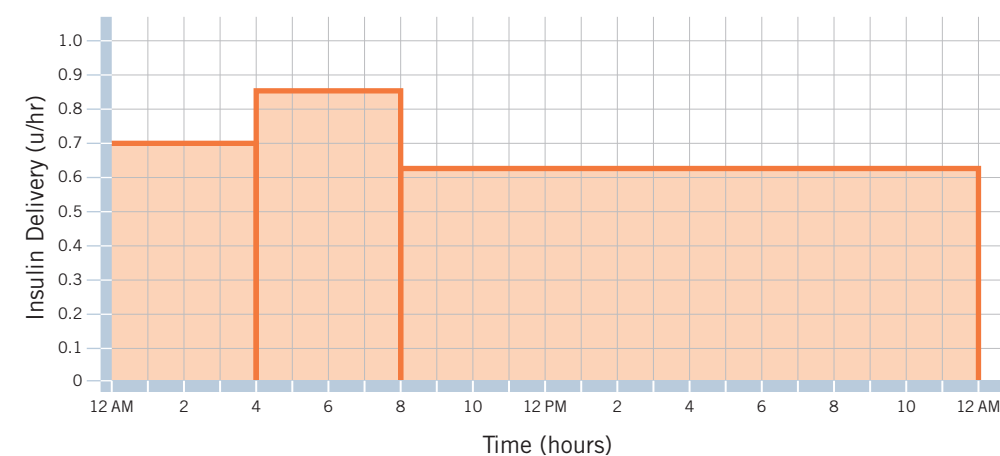
### One Basal Rate:

- From 12 AM until 12 AM (24 hours), 0.70 units of insulin will be delivered per hour.

### Three Basal Rates:

- From 12 AM until 4 AM, 0.70 units of insulin will be delivered per hour.
- From 4 AM until 8 AM, 0.85 units of insulin will be delivered per hour.
- From 8 AM until 12 AM, 0.62 units of insulin will be delivered per hour.

### Sample Basal Rate Profile Showing Three Basal Rates





# Customizing Your Insulin Dose Settings



It is highly encouraged that you allow your Tandem pump to calculate boluses by entering the grams of carbohydrate you plan to eat and your current glucose.

## Calculating Insulin Boluses

Your Tandem pump is designed to easily and accurately calculate boluses based on the insulin dose setting decided upon by you and your healthcare provider. Simply enter the grams of carbohydrate you plan to eat and/or your current glucose reading. Your Tandem pump will calculate your insulin bolus based on these settings.

### Using a Carb Ratio for a Food Bolus

Carbohydrate converts to glucose immediately causing a sudden rise in glucose. For this reason, it is encouraged that you dose insulin before eating carbohydrate foods in order to prevent post-meal hyperglycemia. A Food Bolus can be taken alone or combined with a Correction Bolus. Your Tandem pump will calculate your Food Bolus based on two factors:

- The amount of carbohydrate you are eating (refer to Chapter 4, Understanding Carbohydrate Counting).
- Your carb ratio

The carb ratio is the amount of carbohydrate in grams that 1 unit of insulin will cover. For example, a carb ratio of 1 to 10 (also written 1:10) indicates that 1 unit of insulin is needed for every 10 grams of carbohydrate.



### Checkpoint

List the two reasons to deliver an insulin bolus.

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_

## Standard Formula for Calculating a Food Bolus

$$\frac{\text{Grams of Carb}}{\text{Carb Ratio}} = \text{Food Bolus}$$

Example:

$$\frac{45}{10} = 4.5 \text{ units}$$

Using a carb ratio of 1:10



### Calculate a Food Bolus.

If you are eating 60 grams carbohydrate, with a carb ratio of 1:15, how much insulin will you need?

$$\frac{60 \text{ grams}}{15} = \boxed{\hspace{2cm}}$$

(Food Bolus)

Your Tandem pump can also total all of your carbohydrate entries and calculate a bolus to the hundredth of a unit using your carb ratio. However, for your bolus to be “spot on,” good carbohydrate counting skills along with an accurate carb ratio are necessary. The table below shows the difference in the amount of insulin calculated for 30 grams of carbohydrate using a variety of ratios.

### Boluses Calculated for 30 Grams of Carbohydrate

| Carb Ratio | Insulin Units | Carb Ratio | Insulin Units | Carb Ratio | Insulin Units |
|------------|---------------|------------|---------------|------------|---------------|
| 1:4.5      | 6.66          | 1:9        | 3.33          | 1:19       | 1.57          |
| 1:5        | 6.00          | 1:10       | 3.00          | 1:20       | 1.50          |
| 1:5.5      | 5.45          | 1:11       | 2.72          | 1:21       | 1.43          |

As you can see, the amount of insulin that would be delivered as a bolus can vary quite a bit. This would have an effect on your post-meal glucose, especially with larger and more frequent meals.

### Using Your Target Glucose

The target glucose setting in your Tandem pump is a specific glucose goal used to calculate a Correction Bolus. When a glucose value is entered into your Tandem pump, the insulin bolus will be adjusted up or down as needed to attain your target. By using a target, your Tandem pump is able to “zero in” with precision to help reach your glucose goal.

Your Tandem pump can be programmed with a number of glucose targets by time of day. For example, you may choose to set a higher target at bedtime in order to minimize the risk of overnight low glucose. Discuss with your healthcare provider the target goals that are right for you.

# Customizing Your Insulin Dose Settings



### Checkpoint

What setting reflects the amount of glucose (in mmol/L) that is lowered by 1 unit of insulin?

Answer

### Calculating a Correction Bolus

When your glucose is not at target, your Tandem pump will calculate the amount of insulin needed to reach your target glucose. It does this by using a correction factor, sometimes referred to as a sensitivity factor, to calculate a Correction Bolus. Your Tandem pump will use the following to calculate the Correction Bolus:

- Current glucose
- Target glucose
- Correction factor
- Insulin on board (IOB) and insulin duration, discussed later in this chapter

The correction factor reflects the amount of glucose (in mmol/L) that is lowered by 1 unit of insulin. For example, a correction factor of 2.8 indicates 1 unit of insulin will lower your glucose 2.8 mmol/L.



### Calculate a Correction Bolus.

With a glucose of 14 mmol/L, a target glucose of 6 mmol/L, and a correction factor of 1:2.5 mmol/L, what insulin dose would be calculated?

$$\frac{14 \text{ mmol/L} - 6 \text{ mmol/L}}{2.5 \text{ (correction factor)}} = \boxed{\hspace{2cm}} \text{ (Correction Bolus)}$$

Notes: \_\_\_\_\_

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## Standard Formula for Calculating a Correction Bolus

$$\frac{\text{Current glucose (mmol/L)} - \text{target glucose (mmol/L)}}{\text{Correction Factor}} = \text{Correction Bolus}$$

Using a correction factor of 3.0 and target glucose of 6.0 mmol/L

#### Example 1

If your glucose is above target

$$\frac{12 - 6}{3} = 2 \text{ units}$$

#### Example 2

If your glucose is below target

$$\frac{4.5 - 6}{3} = -0.5 \text{ units}$$

no bolus is suggested



# Customizing Your Insulin Dose Settings



## Checkpoint

The amount of insulin remaining in your body from previous boluses that will continue to lower your glucose is referred to as

Answer

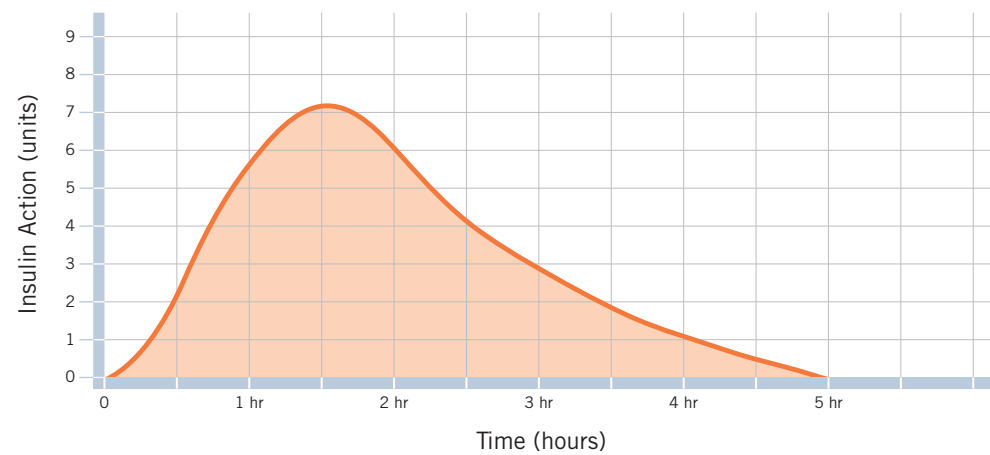
### Understanding Insulin Duration (Duration of Insulin Action)

Your Tandem pump remembers how much insulin is remaining from previous Food or Correction Boluses. It does this by relying on the insulin duration setting when calculating a Correction Bolus. The insulin duration reflects the amount of time an insulin bolus is actively lowering your glucose.

While the insulin duration reflects the amount of time insulin lowers your glucose, the IOB (insulin on board displayed on your home screen) reflects how much insulin is remaining in your body from previous boluses that will continue to lower your glucose. This is sometimes referred to as “active insulin.” The insulin duration setting is needed to calculate IOB. It does not include any basal insulin, only insulin delivered as a Food or Correction Bolus.

The graph below demonstrates the insulin duration of rapid-acting insulin and how it is not equally distributed over time. It is most active 1-3 hours following a bolus; however, it may continue to actively lower your glucose up to 5 hours once it is delivered. This directly influences the bolus calculation.

Duration of Insulin Action



(Adapted from Walsh, 2017)

For example, if the insulin duration in your Tandem pump is set for 5 hours, 3 hours after a Food or Correction Bolus your IOB would reflect 2 hours of insulin remaining on board (in your body). This means that your glucose could continue to drop over the next 2 hours. Your Tandem pump would reduce the recommended bolus to prevent “insulin stacking” which could lead to hypoglycemia.

## Standard Formula Using IOB to Calculate a Bolus

1) Begin with a Correction Calculation

$$\frac{\text{Current glucose (mmol/L)} - \text{target glucose (mmol/L)}}{\text{Correction Factor}} = \text{Correction Bolus}$$

2) Next, Subtract the IOB

$$\text{Correction Bolus} - \text{IOB (Insulin on Board)} = \text{Calculated Bolus}$$

Using a current glucose of 14 mmol/L, a correction factor of 2.5, a target glucose of 6 mmol/L, and 0.8 units of IOB remaining

Example:

$$\frac{(14 - 6)}{2.5} = 3.2 \text{ units}$$

$$3.2 \text{ units} - 0.8 \text{ units} = 2.4 \text{ units}$$

### Pitfalls to an Inaccurate Insulin Duration Setting

| Insulin Duration Set Too Short   | Insulin Duration Set Too Long   |
|--|---|
| <ul style="list-style-type: none"> <li>• Hides true IOB</li> <li>• Leads to insulin stacking</li> <li>• Increases risk of hypoglycemia</li> <li>• Leads to incorrect adjustments to basal rate, carb ratio, and correction factor</li> </ul> | <ul style="list-style-type: none"> <li>• Hides true IOB</li> <li>• Leads to inadequate correction dose</li> <li>• Increases risk of hyperglycemia</li> <li>• Leads to incorrect adjustments to basal rate, carb ratio, and correction factor</li> </ul> |

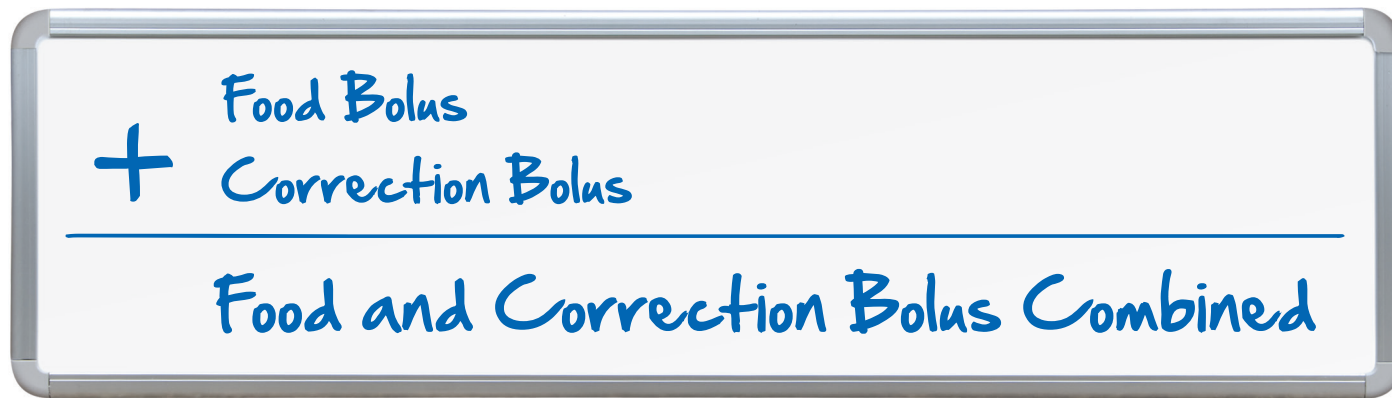
An accurate insulin duration setting prevents insulin stacking, improves bolus accuracy, and reveals current carbohydrate or insulin deficit.

*Note: While insulin duration can be influenced by immediate factors including activity, exercise, and hot weather, it is not recommended to change the insulin duration as a temporary measure.*

# Customizing Your Insulin Dose Settings

## Putting It All Together: Calculating a Bolus

Now that you have a better understanding of the key insulin dose settings, let's put it all together to see how your carb ratio, correction factor, target glucose, and insulin duration are used to calculate a bolus.



### Food Bolus

When grams of carbohydrate are entered, your Tandem pump will use your carb ratio to calculate the amount of insulin needed for a Food Bolus.

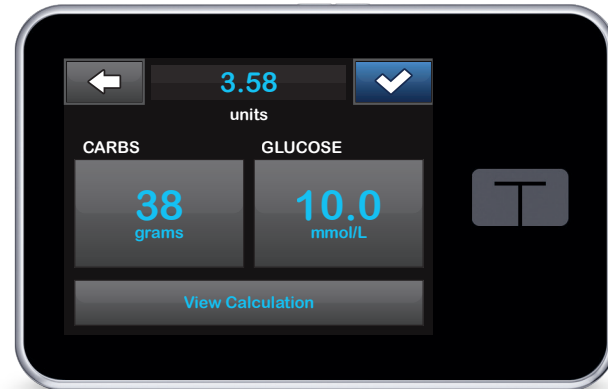
### Correction Bolus

When your glucose is above your target glucose – Your Tandem pump will use your correction factor to calculate the amount of insulin needed to reach your target glucose. If IOB is present, it will be used in the calculation of the bolus.

When your glucose is below your target glucose – Your Tandem pump will display a message advising you to eat carbs and retest glucose.

### Food and Correction Bolus Combined

When your glucose is above your target glucose – The insulin for the Food Bolus and the Correction Bolus will be added together. If IOB is present, it will only be used in the calculation of the correction portion of the bolus.



When your glucose is between 3.9 mmol/L and your target glucose – You will be given an option to reduce the Food Bolus to correct for the low glucose. In addition, if IOB is present, it will also be used to reduce the bolus calculation.

When your glucose is below 3.9 mmol/L – The Food Bolus will be reduced to correct for the low glucose. In addition, if IOB is present, it will be used in the calculation of the Food Bolus in order to return your glucose to target.

With your Tandem pump, you don't have to calculate a dose, track active insulin, or inject insulin every time you eat or when your glucose is high. Now, just enter your glucose and/or the grams of carbohydrate you plan to eat, and your Tandem pump will calculate the insulin you need.

## Actively Managing Your Insulin Dosing

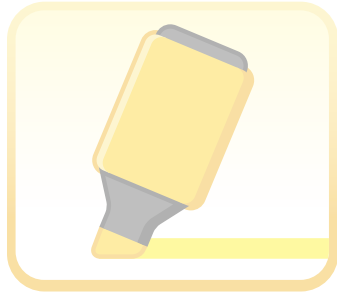
Keep in mind, your Tandem pump is only as smart as the information that is provided to it. Only you know if your glucose is trending up or down, if you are planning to exercise, if you are sick, or other events that may affect your glucose. Minor adjustments to your bolus may be needed for these occurrences. Remember to periodically evaluate and fine-tune your insulin dose settings and always discuss any adjustments to these settings with your healthcare provider.



### Do you know your Tandem pump dose settings?

| Time     | Basal Rate<br>(0; 0.100–15 u) | Correction Factor<br>(1–33.3) | Carb Ratio<br>(1–300) | Target Glucose<br>(3.9–13.9 mmol/L) |
|----------|-------------------------------|-------------------------------|-----------------------|-------------------------------------|
| Midnight |                               |                               |                       |                                     |
|          |                               |                               |                       |                                     |
|          |                               |                               |                       |                                     |
|          |                               |                               |                       |                                     |
|          |                               |                               |                       |                                     |

# Customizing Your Insulin Dose Settings



## Chapter Highlights

- Your healthcare provider will help you calculate and program the following five insulin dose settings into your Tandem pump.
  - Basal rate – the amount of rapid-acting insulin delivered over one hour.
  - Correction factor – the amount of glucose lowered by 1 unit of insulin.
  - Carb ratio – the amount of carbohydrate (in grams) that 1 unit of insulin will cover.
  - Target Glucose – a specific glucose goal used to calculate a correction dose.
  - Insulin duration – the amount of time insulin will actively lower your glucose.
- Insulin on board (IOB) is the amount of insulin remaining in your body from previous boluses.
- Insulin stacking occurs when previous boluses are active while a new bolus is being delivered. Your Tandem pump tracks IOB to help prevent insulin stacking and hypoglycemia.



## Checkpoint Answers

- List the two reasons to deliver an insulin bolus.  
*Answer: Food and correction*
- What setting reflects the amount of glucose (in mmol/L) that is lowered by 1 unit of insulin?  
*Answer: Correction factor*
- The amount of insulin remaining in your body from previous boluses that will continue to lower your glucose is referred to as?  
*Answer: Insulin on board (IOB).*



## Activity Answer Key – Calculate a Correction Bolus

- Calculate a Food Bolus.

$$\frac{60 \text{ grams}}{15} = \boxed{\text{(Food Bolus)}}$$

*Answer: 4 units*

- Calculate a Correction Bolus.

$$\frac{14 \text{ mmol/L} - 6 \text{ mmol/L}}{2.5 \text{ mmol/L (correction factor)}} = \boxed{\text{(Correction Bolus)}}$$

*Answer: 3.2 units*



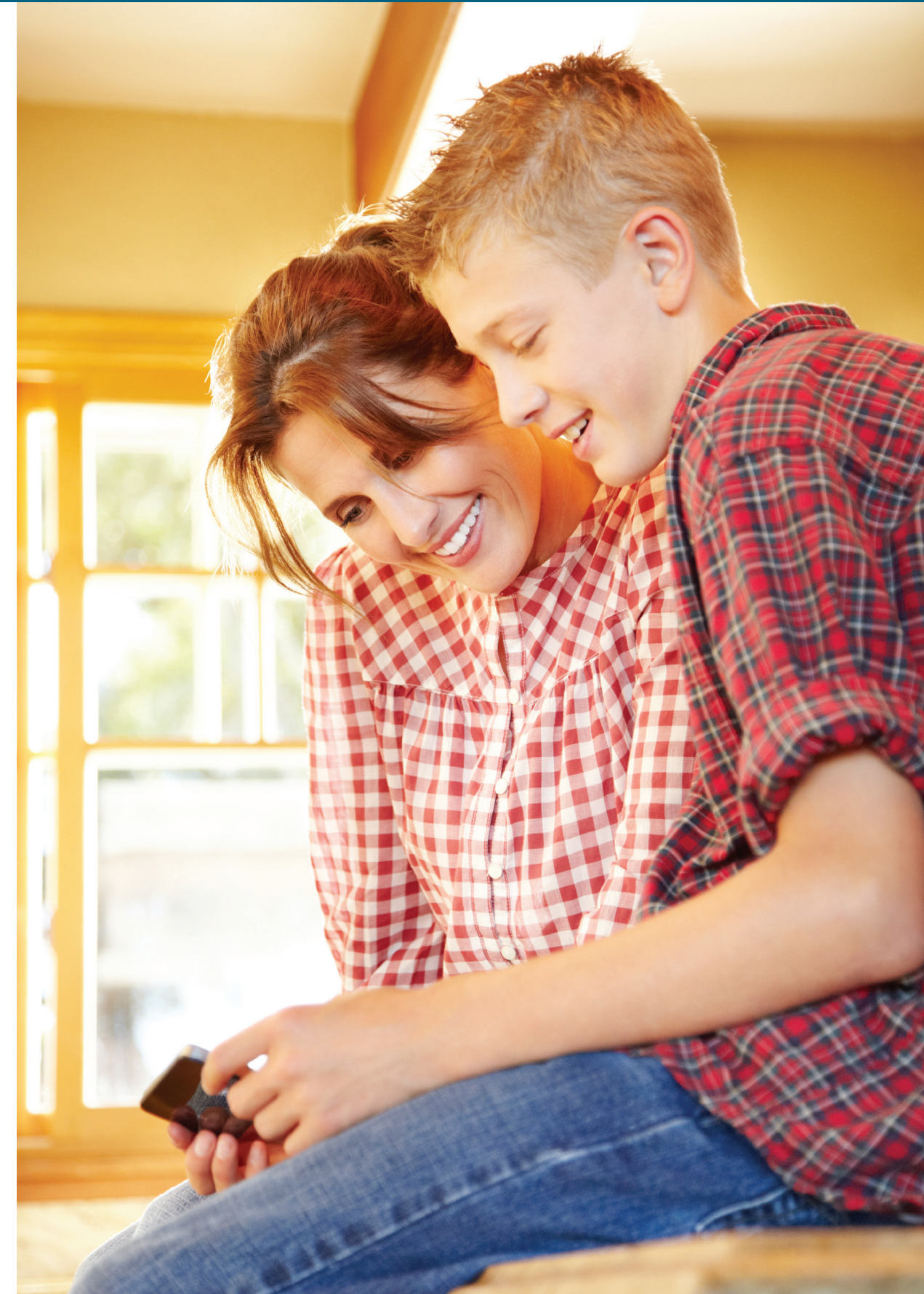
## Managing Your Daily Diabetes Tasks

Establishing good daily habits will keep you on track for success.

As someone with diabetes, you know there are particular daily tasks to help you best manage your diabetes. With time, and as you become more experienced with insulin pump therapy, you will likely feel that managing diabetes becomes easier compared to when you took injections.

This chapter focuses on the tools for daily diabetes management that can help you manage your diabetes effectively.

- Daily pumping tasks
- Record keeping
- Supplies to carry and keep at home





# Managing Your Daily Diabetes Tasks



### Training Tip

Continuous glucose monitoring (CGM) uses a sensor that is inserted under the skin surface to continually read glucose values. Talk to your healthcare provider to find out more about CGM.

## Managing Your Daily Pumping Tasks

What you do on a day-to-day basis will play a role in the success of your insulin pump therapy and the management of your diabetes. The following daily tasks will help you achieve the best results.

### Monitor your Glucose

Research shows that the more you monitor your glucose, the better your control will be (*Exp Clin Endocrinol Diabetes*. 2006; p. 384–388).

- At least four glucose checks every day are recommended.
- Additional monitoring may be needed for troubleshooting high or low glucose and to evaluate your insulin dose settings.
- If you are new to insulin pumping, you may need to do more.
- Continuous glucose monitoring allows you to see more glucose values and trends than glucose monitoring alone.

### Check Your Infusion Set and Site

Make sure your infusion site is problem free.

- If there is any discomfort, redness, swelling, or discharge, change your infusion set and site. You may need to contact your healthcare provider.
- Inspect the tubing for air. If you see bubbles or an air space, disconnect the tubing from your body and clear the air out by performing the Fill Tubing step through the Load menu. Always disconnect the tubing from your body while performing any step in the Load process. Refer to your pump user guide for help.

### Check Your Tandem Pump

Make it a daily habit to review your settings. For instance:

- Are the date and time correct?
- Is the Personal Profile you expect to be running, actually running?
- Have there been any recent alerts or alarms?
- Do you have plenty of insulin in the cartridge?
- Is there enough battery charge to get through the day?

## Keep Records

Keeping logs, in one form or another, will help you to keep track of what works and what doesn't. Read on to learn more about record keeping in this chapter.

## Carry What You Need

When pumping insulin, you still need to carry important diabetes supplies every day. A list of supplies will be provided in this chapter.

## Evaluate the Foods You Are Eating

Count the grams of carbohydrate in your food and think about other aspects of your food that might have an impact on your glucose. Refer to Chapter 4 for information about carbohydrate counting.



### Checkpoint

List at least three daily tasks that will help you get the most out of insulin pump therapy.

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_

# Managing Your Daily Diabetes Tasks

## Keeping Records

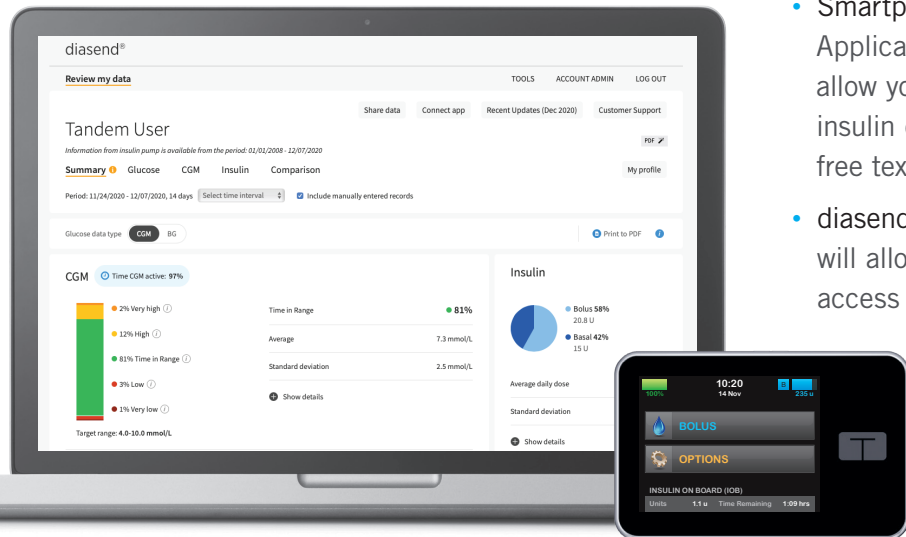
While keeping glucose records can be a challenge, it is one of your most important daily tasks and a key tool in managing your glucose. Everyone is unique. Keeping daily records of your glucose and how it is impacted by what you eat, your work schedule, and other factors, can help you be as precise as possible with your insulin dosing.

Eventually, you may find that keeping detailed daily records will help motivate you toward healthier behavior, which in turn will motivate you to keep up with your record-keeping. If you are having a difficult time staying motivated, please refer to Appendix C for a list of helpful resources.

Listed below are a variety of record-keeping methods to help keep you on track.

- **Logbooks (paper and electronic)** – Some healthcare providers prefer logbooks with manual entries. They are easy to access, and the formatting is consistent. Many allow free text entries, which make the information invaluable when looking at your corresponding glucose.
- **Meter downloads** – Downloading glucose logs from your meter is another option. While this can be easy, keep in mind that some pertinent data may not be there, such as specific foods eaten, insulin dosing, and activities.
- **CGM downloads** – Continuous glucose monitors provide software for downloading glucose values and other events that you enter into your CGM. Again, like meter downloads, some pertinent data may not be there.

- **Smartphone applications or tablets** – Applications for smartphones or tablets allow you to enter glucose values, insulin dosing, food, activities, as well as free text notes.
- **diasend** – diasend is a software program that will allow you to download your pump and access information regarding your blood sugars and insulin delivery history.



From the list below, select each item that has influenced your glucose in the past.

- |   |   |
|---|---|
| <input type="checkbox"/> Food: carbohydrate counting error                                    | <input type="checkbox"/> Medications                |
| <input type="checkbox"/> Food: carbohydrate counting accurate, but question glycemic response | <input type="checkbox"/> Exercise/physical activity |
| <input type="checkbox"/> Insulin dose too high or too low                                     | <input type="checkbox"/> Travel: drives or flights  |
| <input type="checkbox"/> Timing of insulin  | <input type="checkbox"/> Travel: time zone change   |
| <input type="checkbox"/> Stress   | <input type="checkbox"/> Changing work schedule     |
| <input type="checkbox"/> Illness  | <input type="checkbox"/> Denatured (bad) insulin    |
| <input type="checkbox"/> Infection  | <input type="checkbox"/> Alcohol                    |
| <input type="checkbox"/> Period following high or low glucose event                           | <input type="checkbox"/> Other influences: _____    |
| <input type="checkbox"/> Hormonal changes   | _____   |

Did you check all or most of them? Were there additional items to add? Considering these influences will be very useful as you work through glucose pattern management.

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# Managing Your Daily Diabetes Tasks

## Supplies to Carry and to Keep at Home

When pumping insulin, you will still need to carry almost everything you did before and a few new things. It is best to have a kit that you keep in the same, handy place so you will never be without your supplies. In addition to the supplies you carry every day, be prepared with extra supplies at home and when traveling. Keep in mind that insulin pump supplies require a prescription and usually cannot be purchased at retail stores or local pharmacies.

### Supplies to Carry Every Day:

- Glucose testing supplies: meter, strips, lancets, meter batteries
- Fast-acting carbohydrate for low glucose
- Extra snack for longer coverage than fast-acting carbohydrate
- Glucagon emergency kit (for recurrent, severe hypoglycemia)
  - Rapid-acting insulin and syringes
    - Infusion sets (a minimum of two)
    - Insulin pump cartridges (a minimum of two)
    - Infusion site preparation products (antiseptic wipes, skin adhesive)
      - Ketone testing strips
      - Diabetes identification card or jewelry
      - Tandem pump USB cable
      - CGM supplies (if using)

### Supplies to Keep at Home:

- Glucose testing supplies: meter, strips, lancets, meter batteries
- Fast-acting carbohydrate for low glucose
- Extra snacks for longer coverage than fast-acting carbohydrate
- Glucagon emergency kit (for recurrent, severe hypoglycemia)
- Rapid-acting insulin and syringes
- At least one full box of infusion sets and cartridges
- Infusion site preparation products (antiseptic wipes, skin adhesive)
- Ketone testing strips
- Long-acting insulin or a prescription in case you need to be without your Tandem pump for a period of time.
- Written plan describing how to cover yourself with injections if you need to be without your Tandem pump for a period of time. Discuss a backup plan with your healthcare provider.
- Tandem pump USB cable
- CGM supplies (if using)

### Supplies to Carry When Traveling:

- Take your usual everyday carry kit
- Estimate how many cartridges and infusion sets you will need and take two to three times this amount.
- Additional rapid-acting insulin and a prescription
- Long-acting insulin or a prescription
- Written plan describing how to cover yourself with injections if you need to be without your Tandem pump for a period of time. Discuss a back-up plan with your healthcare provider.
- Tandem pump USB cable
- CGM supplies (if using)

### Emergency Preparedness and Evacuation:

- Supplies for travel (plus more than you would need under normal circumstances)
- Cooler or cooling pack for insulin



### Checkpoint

What supplies are best to carry in your everyday kit?

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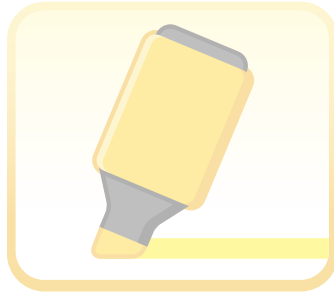


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Answer



## Managing Your Daily Diabetes Tasks



### Chapter Highlights

- Practicing a daily diabetes management routine is critical for positive outcomes with insulin pump therapy.
- For the best results, monitor your glucose a minimum of four times per day, preferably more.
- Establish a good record keeping system to evaluate what you do on a day-to-day basis and share it with your healthcare provider.
- Be prepared and carry the following supplies for daily use: glucose testing supplies, fast-acting carbohydrate, extra snack, glucagon emergency kit, rapid-acting insulin and syringes, infusion sets, extra cartridges, infusion site preparation products, ketone testing strips, diabetes identification, Tandem pump USB cable, CGM supplies (if using).
- Ensure that you have the following items at home: glucose testing supplies, fast-acting carbohydrate, extra snacks, glucagon emergency kit, rapid-acting insulin and syringes, full box of infusion sets and insulin cartridges, infusion site preparation products, ketone testing strips, long-acting insulin or prescription, backup plan, Tandem pump USB cable, CGM supplies (if using).
- When traveling, plan ahead and carry the following: everyday kit, extra infusion sets and insulin cartridges, additional rapid-acting insulin, long-acting insulin or prescription, backup plan, Tandem pump USB cable, CGM supplies (if using).



### Checkpoint Answers

1. List at least three daily tasks that will help you get the most out of insulin pump therapy.

*Answer:*

- *Monitor your glucose frequently*
- *Check your infusion site and set*
- *Check your Tandem pump*
- *Keep detailed records*
- *Carry diabetes management supplies*
- *Evaluate the impact of the foods you are eating*

2. What supplies are best to carry in your everyday kit?

*Answer:*

- *Glucose testing supplies*
- *Fast-acting carbohydrate*
- *Extra snack*
- *Glucagon emergency kit*
- *Rapid-acting insulin and syringes*
- *Infusion sets*
- *Insulin pump cartridges*
- *Infusion site preparation products*
- *Ketone testing strips*
- *Diabetes identification card or jewelry*
- *Tandem pump USB cable*
- *CGM supplies (if using)*



## Understanding Carbohydrate Counting

Developing a healthy relationship between carbohydrate counting and insulin dosing is a powerful tool for success.

Managing your diabetes involves a variety of tools and techniques to keep you in check. As you know, food has a big effect on your glucose. Carbohydrate counting offers the flexibility of matching your insulin to the carbohydrate foods that you eat.

This chapter will help you gain a better understanding of carbohydrate counting and includes the following:

- Tools for identifying carbohydrate and estimating the amount of carbohydrate in food
- Reading and understanding nutrition food labels
- Learning about factors that may have an impact on your glucose and insulin dosing





# Understanding Carbohydrate Counting



## Training Tip

Carbohydrates are sugars and starches the body breaks down into glucose and uses as an energy source.

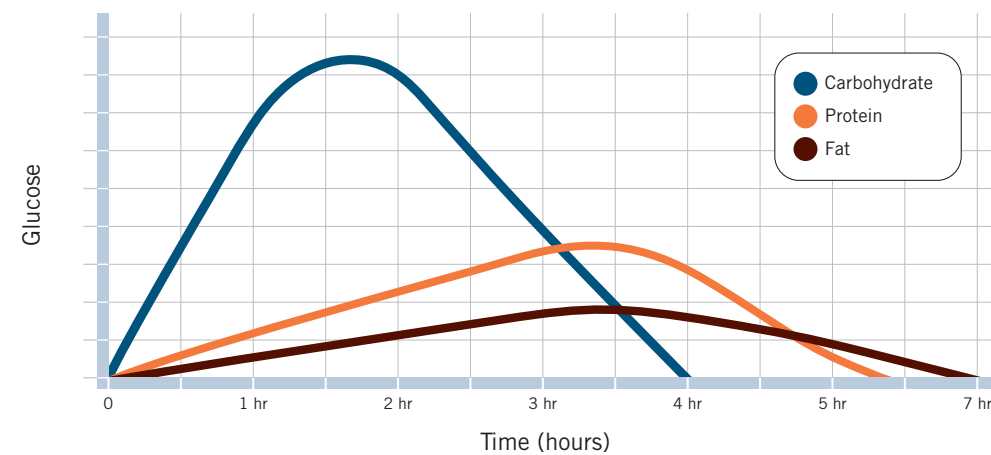
## Understanding Carbohydrate Counting: The Basics

Carbohydrate counting is a method for estimating the carbohydrate content in food. It is not a “diet,” but a way of balancing the carbohydrate you eat with your insulin dose. Understanding carbohydrate counting will give you more flexibility with your food and lifestyle choices.

Calories from food derive from three nutrients: fat, protein, and carbohydrate. Each nutrient affects glucose differently, however, carbohydrate has the greatest impact on glucose.

Within minutes of eating carbohydrate, glucose levels start to rise. After 1-2 hours, most of the carbohydrate has been converted into glucose. Insulin must be available in your blood to carry glucose from your bloodstream into the cells.

### Effects of Nutrients on Glucose Over Time



(Adapted from Whitney, 2015)

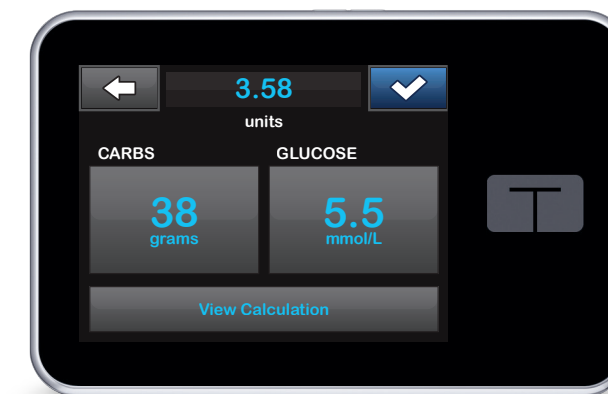
## Carbohydrate Counting and Insulin Pump Therapy – A Dynamic Duo

The amount of carbohydrate that you enter into your Tandem pump at each meal and snack will determine how much insulin will be calculated and delivered as a Food Bolus. Carbohydrate counting combined with insulin pump therapy offers more flexibility by:

- Matching insulin more precisely with carbohydrate.
- Allowing more flexibility with food choices.
- Allowing more flexibility with meal timing.

Entering carbohydrate grams into your Tandem pump is just a few taps away; however, estimating the amount of carbohydrate in your food may prove to be more of a challenge. Keep in mind, carbohydrate counting is not an exact science. It is a system that uses a variety of tools and techniques to help you make an educated guess. To effectively count carbohydrate, there are three questions to help guide you. They are:

1. What foods contain carbohydrate?
2. How much food am I eating?
3. How much total carbohydrate am I eating?



## Checkpoint

Of the three major nutrients, carbohydrate, protein, and fat, which has the greatest impact on your glucose?

Answer

# Understanding Carbohydrate Counting



## “What Foods Contain Carbohydrate?”

Almost everything contains carbohydrate! Below is a short list of common foods that contain carbohydrate:

- Grains: bread, cereal, rice, pasta
- Starchy vegetables: potatoes, corn, peas, beans
- Non-starchy vegetables contain a small amount of carbohydrate
- Fruit and fruit juice
- Milk and milk products
- Desserts and other sweets
- Some sauces, spreads, and dips



Where’s the carbohydrate? Check all foods below that contain carbohydrate.

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Bread                | <input type="checkbox"/> Frankfurter          | <input type="checkbox"/> Fat-free frankfurter   |
| <input type="checkbox"/> Cheese               | <input type="checkbox"/> Whole milk           | <input type="checkbox"/> Beans                  |
| <input type="checkbox"/> Tofu                 | <input type="checkbox"/> Fat-free milk        | <input type="checkbox"/> Soy sauce              |
| <input type="checkbox"/> Shrimp               | <input type="checkbox"/> Fruit salad          | <input type="checkbox"/> Pizza                  |
| <input type="checkbox"/> Apples               | <input type="checkbox"/> Potatoes             | <input type="checkbox"/> Mustard                |
| <input type="checkbox"/> Sugar                | <input type="checkbox"/> Tortillas            | <input type="checkbox"/> French fries           |
| <input type="checkbox"/> Steak                | <input type="checkbox"/> Eggs                 | <input type="checkbox"/> Light beer             |
| <input type="checkbox"/> Pasta                | <input type="checkbox"/> Yogurt               | <input type="checkbox"/> Mayonnaise             |
| <input type="checkbox"/> Rice                 | <input type="checkbox"/> Sugar-free pudding   | <input type="checkbox"/> Ice cream              |
| <input type="checkbox"/> Beer                 | <input type="checkbox"/> Coleslaw             | <input type="checkbox"/> Peanut butter          |
| <input type="checkbox"/> Barbecue ribs        | <input type="checkbox"/> Fish                 | <input type="checkbox"/> Sugar-free cookies     |
| <input type="checkbox"/> Ranch salad dressing | <input type="checkbox"/> Marinara pasta sauce | <input type="checkbox"/> Breaded chicken strips |
| <input type="checkbox"/> Sugar-free gelatin   | <input type="checkbox"/> Sliced turkey        | <input type="checkbox"/> Ketchup                |

## “How Much Food Am I Eating?”

The amount of carbohydrate that you eat will affect the amount of insulin you need. It is easy to under or overestimate the amount of food you are eating. Even a small miscalculation entry can affect the amount of insulin your Tandem pump will calculate for a bolus. Weighing and measuring the food you eat can help keep your carbohydrate counting accurate. This, in turn results in better glucose control.

It is not necessary or practical to weigh and measure your food every time you eat. The practices and techniques in this chapter will help to “train your eye.” The more you practice, the better you will be able to estimate carbohydrate when it is not practical to measure, for example, when dining out.

### Here Are Some Helpful Tips for Weighing and Measuring Foods:

- Use a dry measuring cup for measuring solid foods. The food should be level with the top of the cup.
- Use a liquid measuring cup for measuring liquids. The liquid should be at eye level with the top of the cup.
- Use a kitchen scale for food that will not easily fit into measuring cups, like whole fruit or bread.



### Training Tip

The amount of carbohydrate needed varies from person to person. Speak with your healthcare provider for specific recommendations.





# Understanding Carbohydrate Counting



### Training Tip

Officially recognized sites, groups, and associations are formally acknowledged as maintaining a certain set of standards in the industry. Beware of sites or groups that are not credible and whose primary goal is to sell a product. Though some of these may be valid, ensure that one or more of the following criteria are met.

1. Reviewed or updated at least every five years.
2. The medical content is supported with reputable references.
3. If the article or website is written by an individual, credentials should be listed.

## “How Much Total Carbohydrate Am I Eating?”

### Carbohydrate Counting Resources

Countless resources are available to help you estimate carbohydrate in food. Some options are listed below.

- Nutrition Facts Tables can be found on all packaged foods in Canada. This is the most reliable source of information when counting carbohydrates.
- Printed Materials in the form of books, booklets, cookbooks, and handouts have become increasingly popular. Look for officially recognized publications for the most accurate and reliable information. Cookbooks and recipes with nutrient breakdown are recommended.
- Online Resources are available in a variety of formats. Again, look for officially recognized sites.
- Software Applications for carbohydrate counting are easily downloaded onto your computer, tablet, and/or smartphone. Many are offered with printed material or a resource book.
- Restaurants and Fast Food chains are now offering nutrition information for the health-conscious eater. This information can be found at the restaurant or online.

See Appendix C for a list of carbohydrate-counting resources.



### Nutrition Facts Table

The Nutrition Facts are regulated by Health Canada. They are easy-to-use resources for estimating carbohydrate in foods.

| Nutrition Facts                |               |
|--------------------------------|---------------|
| Per 90 g serving (2 slices)    |               |
| Amount                         | % Daily Value |
| <b>Calories</b> 170            |               |
| <b>Fat</b> 2.7 g               | <b>4 %</b>    |
| Saturated 0.5 g<br>+ Trans 0 g | <b>5 %</b>    |
| <b>Cholesterol</b> 0 mg        |               |
| <b>Sodium</b> 200 mg           | <b>8 %</b>    |
| <b>Carbohydrate</b> 36 g       | <b>13 %</b>   |
| Fibre 6 g                      | <b>24 %</b>   |
| <b>Sugars</b> 3 g              |               |
| <b>Protein</b> 8 g             |               |
| Vitamin A 1 %                  | Vitamin C 0 % |
| Calcium 2 %                    | Iron 16 %     |

### Finding carbohydrate values using the Nutrition Facts table

The amount of carbohydrate in a food is listed on the Nutrition Facts table.

- The amount listed is for the serving size given. Are you eating more, less, or the same amount? Compare your serving size to figure out the amount of carbohydrate you are eating.
- The total amount of carbohydrate in grams is listed first. This number includes starch, sugars and fibre. (Starch is not listed separately.)

- Fibre does not raise blood sugar and should be subtracted from the total carbohydrate (i.e. 36 g carbohydrate – 6 g fibre = 30 g available carbohydrate).
- Sugar includes all naturally occurring and/or added sugars and is included in the Carbohydrate. Do not discount a food because it is high in sugar. Some healthy foods have naturally occurring sugars, like fruit.

### Example

In this example 2 slices of this product contains 30g of available carbohydrates.

Let's consider a different serving amount:

|             |   |                                |
|-------------|---|--------------------------------|
| If 2 slices | = | 30g of available carbohydrates |
| 1 slice     | = | 15g of available carbohydrates |
| 3 slices    | = | 45g of available carbohydrates |

The Sugar listing under Total Carbohydrate is very misleading. All carbohydrate (sugar and starch) is included as Carbohydrate. Focusing on sugar alone reveals only a small part of the picture.



### Checkpoint

What should be subtracted from the total amount of carbohydrate because it doesn't affect blood sugar?

Answer



# Understanding Carbohydrate Counting

## Other Nutrition Facts Considerations

- Make healthy food choices. Enjoy a variety of vegetables, fruits, whole grains, low fat milk products, and meat and alternatives at your meals. A variety of foods will help to keep you healthy. Use added fats in small amounts. This helps to control your weight and blood cholesterol. Choose portion sizes to help you to reach or maintain a healthy weight.
- Focus on carbohydrate. Your body breaks down carbohydrate into sugar (glucose). This raises your blood sugar levels. Carbohydrate is found in many foods including grains and starches, fruits, some vegetables, legumes, milk and milk alternatives, sugary foods, and many prepared foods. Meat and alternatives, most vegetables, and fats contain little carbohydrate. Moderate servings will not have a big effect on blood sugar levels.
- Set carbohydrate goals. Your dietitian will help you set a goal for grams of carbohydrate at each meal and snack. This may be the same from day to day or may be flexible, depending on your needs. Aim to meet your target within 5 grams per meal or snack.
- Determine carbohydrate content. Write down what you eat and drink throughout the day. Be sure to note the portion sizes. You may need to use measuring cups and food scales to be accurate. Record the grams of carbohydrate in these foods and drinks. For carbohydrate content of foods, check the Beyond the Basics resources, food packages, food composition books, restaurant fact sheets and websites.
- Monitor effect on blood sugar level. Work with your healthcare team to correct blood sugar levels that are too high or too low.



Food labels in practice. Calculate the carbohydrate.

Example for Raisins

| Nutrition Facts              |               |
|------------------------------|---------------|
| Per ¼ cup (40g)              |               |
| Amount                       | % Daily Value |
| <b>Calories</b> 130          |               |
| <b>Fat</b> 0 g               | <b>0 %</b>    |
| Saturated 0 g<br>+ Trans 0 g | <b>0 %</b>    |
| <b>Cholesterol</b> 0 mg      |               |
| <b>Sodium</b> 0 g            | <b>0 %</b>    |
| <b>Carbohydrate</b> 32       | <b>11 %</b>   |
| Fibre 1 g                    | <b>4 %</b>    |
| Sugar 24 g                   |               |
| <b>Protein</b> 1 g           |               |

1. Calculate the Carbohydrate for ¼ cup serving of raisins

2. Calculate the Carbohydrate for ½ cup serving of raisins

Example for Chick Peas

| Nutrition Facts                |               |
|--------------------------------|---------------|
| Per ½ cup (125ml)              |               |
| Amount                         | % Daily Value |
| <b>Calories</b> 180            |               |
| <b>Fat</b> 3.5 g               | <b>5 %</b>    |
| Saturated 0.3 g<br>+ Trans 0 g | <b>2 %</b>    |
| <b>Cholesterol</b> 0 mg        |               |
| <b>Sodium</b> 30 g             | <b>9 %</b>    |
| <b>Carbohydrate</b> 30         | <b>11 %</b>   |
| Fibre 8 g                      | <b>29 %</b>   |
| Sugar 24 g                     | <b>5 %</b>    |
| <b>Protein</b> 1 g             |               |

3. Calculate the Carbohydrate for ½ cup serving of chick peas

4. Calculate the Carbohydrate for ¼ cup serving of chick peas

# Understanding Carbohydrate Counting

## Carbohydrate Choices

While reference guides and Nutrition Facts labels may offer the most reliable resources for carbohydrate counting, you may not always have them on hand.

The 15-Gram Carbohydrate Reference Guide serves as an easy-to-remember guide. Each food item represents a 15-gram carbohydrate choice. These are NOT suggested portions, but an added resource for estimating carbohydrate. For additional resources, refer to Appendix C.

## A Balancing Act: Other Influences

Carbohydrate counting is an essential part in helping you to maintain a balance between the foods you eat and the insulin you take. Sometimes, even with accurate carbohydrate counting, post-meal glucose may not work out as expected.

The balance of protein, fat, and carbohydrate in a meal has an effect on post-meal glucose. Additionally, eating carbohydrate alone versus eating it together with foods high in protein, fibre, or fat may result in an altogether different post-meal glucose response.

- Protein, to a lesser degree, will convert to glucose. If eaten in large amounts (more than the normal 15–20% of calories) it may increase post-meal glucose.
- Soluble fibre slows down the digestion of the food. Glucose released from carbohydrate will reach your bloodstream slower and may delay the glucose response.
- Fat does not convert to glucose. However, if eaten in large amounts, fat can slow down the digestion of carbohydrate and the release of glucose. This may result in low glucose soon after the meal because your insulin has started to work before all your carbohydrate has been digested. This is followed by a delayed or prolonged elevation in your glucose. In addition, certain fats can cause your body to be more resistant (less sensitive) to insulin for a period of time after eating them. This may result in higher-than-expected glucose levels. The Tandem pump has the possibility to have extended bolus features that can help you with higher fat meal content. Speak with your healthcare provider if you want to know more about these features.



## 15-Gram Carbohydrate Reference Guide

| Bread                                  | 15 grams       |
|--|----------------|
| Bagel, large                           | 1/4 (1 oz)     |
| Bread, white or whole wheat            | 1 slice (1 oz) |
| Biscuit, 2 1/2 in. across              | 1              |
| Corn bread, 1 3/4 in cube              | 1 (.5 oz)      |
| Crackers, round butter type or saltine | 6              |
| English muffin                         | 1/2            |
| Hamburger or hotdog bun                | 1/2            |
| Pancake, 4 in across, 1/4 in thick     | 1              |
| Pretzels                               | 0.75 oz        |
| Stuffing, bread                        | 1/3 cup        |
| Tortilla, corn, 6 in across            | 1              |
| Tortilla, flour, 6 in across           | 1              |
| Tortilla flour, 10 in across           | 1/3 cup        |
| Snack chips, tortilla or potato        | 9–13           |
| Taco shell, 5 in across                | 2              |
| Waffle, 4 in square or 4 in across     | 1              |

| Starchy Vegetables and Beans   | 15 grams         |
|--|------------------|
| Beans, baked   | 1/3 cup          |
| Beans, dried, cooked (kidney, pinto, black, white, garbanzo, lima, etc.) | 1/2 cup          |
| Corn   | 1/2 cup          |
| Corn on the cob, large   | 1 (5 oz)         |
| Lentils, cooked  | 1/2 cup          |
| Mixed vegetables (w/ corn, peas, or pasta)                               | 1 cup            |
| Peas, dried (green, split black-eyed)                                    | 1/2 cup          |
| Potato, baked with skin  | 1/4 large (3 oz) |
| Potato, mashed   | 1/2 cup          |
| Potato, french-fried, oven baked   | 1 cup (2 oz)     |
| Squash, winter (acorn, butternut)  | 1 cup            |
| Sweet potato, yam, plain   | 1/2 cup          |

| Milk Products                           | 12–15 grams |
|---|-------------|
| Milk (skim, low-fat, whole)             | 1 cup       |
| Yogurt, plain or artificially sweetened | 2/3 cup     |

| Cereal and Grains                 | 15 grams  |
|-----------------------------------|-----------|
| Bran cereal, dry, oat             | 1/4 cup   |
| Bran cereal, dry, wheat           | 1/2 cup   |
| Cereal, unsweetened, ready-to-eat | 3/4 cup   |
| Cereal, puffed                    | 1 1/2 cup |
| Granola, low-fat or regular       | 1/4 cup   |
| Grits, cooked                     | 1/2 cup   |
| Oatmeal, cooked, unsweetened      | 1/2 cup   |
| Pasta, cooked                     | 1/3 cup   |
| Rice, cooked, white or brown      | 1/3 cup   |

| Fruit  | 15 grams    |
|--|-------------|
| Apple, unpeeled, small                               | 1 (4 oz)    |
| Banana, extra small                                  | 1 (4 oz)    |
| Berries (black or blue)                              | 3/4 cup     |
| Canned fruit (fruit cocktail, pears, peaches)        | 1/2 cup     |
| Grapefruit, large                                    | 1/2 (11 oz) |
| Grapes, small  | 17 (3 oz)   |
| Melon (cantaloupe, watermelon)                       | 1 cup cubed |
| Peach, medium, fresh                                 | 1 (6 oz)    |
| Orange, small  | 1 (6.5 oz)  |
| Pear, large  | 1/2 (4 oz)  |
| Pineapple, fresh                                     | 3/4 cup     |
| Raisins  | 2 Tbsp      |
| Strawberries, fresh, whole                           | 1 1/4 cup   |
| Fruit Juice: Orange, apple, grapefruit and pineapple | 1/2 cup     |
| Fruit Juice: grape, prune, and juice blend           | 1/4 cup     |

| Other  | 15 grams |
|--|----------|
| Mixed dish or casserole (chili, mac and cheese, tuna noodle, etc.) | 1/2 cup  |
| Ice cream (regular, light, no-sugar added)                         | 1/2 cup  |
| Cookie (chocolate chip, small)                                     | 2.25 in. |

(Adapted from Exchange Lists for Diabetes. ADA, May 2008)





# Understanding Carbohydrate Counting



### Training Tip

Each item is equal to one serving of alcohol:

- 12 oz beer
- 5 oz wine
- 1.5 oz liquor

### Alcohol

Moderate alcohol intake is limited to 2 standard drinks/ day or less than 10 drinks/ week for women; and limited to 3 standard drinks/ day or less than 15 drinks/ week for men.

**BEFORE** drinking alcohol: Eat regular meals, take your medication(s), and check your blood sugar levels frequently (keep your blood glucose meter with you).

**WHILE** drinking alcohol: Eat carbohydrate-rich foods when drinking alcohol.

**AFTER** drinking alcohol: Tell a responsible person that you have been drinking. They should look for low blood sugar symptoms.

People with type 1 diabetes should be aware that moderate consumption of alcohol with, or 2 to 3 hours after, an evening meal may result in delayed low blood sugar (hypoglycemia)

Adapted from: *The Diabetes Canada Clinical Practice Guidelines*



### Nutrition Guide Wrap-Up

There is no specific diet for diabetes. While glucose success is the primary goal of diabetes management, there is more to consider; an overall healthy eating pattern is important for everyone. Healthy lifestyle choices reduce the likelihood of heart disease, osteoporosis, stroke, high blood pressure, and some types of cancer.

A healthy eating pattern will also ensure that you get the right amount of vitamins and minerals, giving you the chance to feel your best every day. If you focus on these food choices, you will reap the benefits of healthy eating and find they will help you meet your glucose goals. Try to include the following food items each day.

- Fresh, whole foods
- Fresh fruits and vegetables
- Foods with a variety of colors
- Whole grains rather than processed or refined
- Lean meats
- Low-fat or fat-free dairy products



### Checkpoint

What additional food items (other than carbohydrate) may impact your post-meal glucose?

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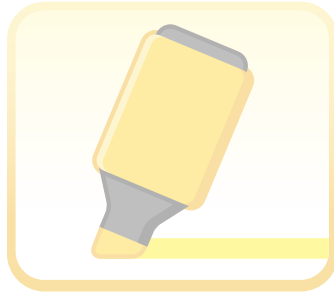


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Answer



# Understanding Carbohydrate Counting



## Chapter Highlights

- Carbohydrate is the body's main source of fuel and has the greatest impact on glucose. Carbohydrate foods are sugars, starches, and fibre.
- Carbohydrate counting is a method of identifying and estimating carbohydrate foods and amounts.
- Carbohydrate counting and insulin pump therapy work well together, allowing you to easily bolus for all of the carbohydrate that you eat.
- To count carbohydrate, first you have to identify the foods that contain carbohydrate by using food lists.
- Next, you will need to know how much food you are eating.
- Finally, you will estimate the amount of carbohydrate in the food you are eating by using Nutrition Facts, reference books, and carbohydrate lists.



## Checkpoint Answers

1. Of the three major nutrients—carbohydrate, protein, and fat— which has the greatest impact on your glucose?  
*Answer: Carbohydrate*
2. What should be subtracted from the total amount of carbohydrate because it doesn't affect blood sugar?  
*Answer:*
  - Fibre
3. What additional food items (other than carbohydrate) may impact your post-meal glucose?  
*Answer:*
  - Protein
  - Fibre
  - Fat
  - Glycemic index/load
  - Alcohol



## Activity Answer Key – Food Labels in Practice

1. Calculate the Carbohydrate for a 1/4 cup serving of this product.  
*Answer: 31 grams*
2. Calculate the Carbohydrate for a 1/2 cup serving of this product.  
*Answer: 62 grams*
3. Calculate the Carbohydrate for 1/2 cup serving.  
*Answer: 22 grams*
4. Calculate the Carbohydrate for 1/4 cup serving.  
*Answer: 11 grams*

## Activity Answer Key – Where's the Carbohydrate?

- |  |  |  |
|--|--|--|
| <input checked="" type="checkbox"/> Bread                | <input type="checkbox"/> Frankfurter                     | <input type="checkbox"/> Fat-free frankfurter              |
| <input type="checkbox"/> Cheese                          | <input checked="" type="checkbox"/> Whole milk           | <input checked="" type="checkbox"/> Beans                  |
| <input checked="" type="checkbox"/> Tofu                 | <input checked="" type="checkbox"/> Fat-free milk        | <input type="checkbox"/> Soy sauce                         |
| <input type="checkbox"/> Shrimp                          | <input checked="" type="checkbox"/> Fruit salad          | <input checked="" type="checkbox"/> Pizza                  |
| <input checked="" type="checkbox"/> Apples               | <input checked="" type="checkbox"/> Potatoes             | <input type="checkbox"/> Mustard                           |
| <input checked="" type="checkbox"/> Sugar                | <input checked="" type="checkbox"/> Tortillas            | <input checked="" type="checkbox"/> French fries           |
| <input type="checkbox"/> Steak                           | <input type="checkbox"/> Eggs                            | <input checked="" type="checkbox"/> Light beer             |
| <input checked="" type="checkbox"/> Pasta                | <input checked="" type="checkbox"/> Yogurt               | <input type="checkbox"/> Mayonnaise                        |
| <input checked="" type="checkbox"/> Rice                 | <input checked="" type="checkbox"/> Sugar-free pudding   | <input checked="" type="checkbox"/> Ice cream              |
| <input checked="" type="checkbox"/> Beer                 | <input checked="" type="checkbox"/> Coleslaw             | <input checked="" type="checkbox"/> Peanut butter          |
| <input checked="" type="checkbox"/> Barbecue ribs        | <input type="checkbox"/> Fish                            | <input checked="" type="checkbox"/> Sugar-free cookies     |
| <input checked="" type="checkbox"/> Ranch salad dressing | <input checked="" type="checkbox"/> Marinara pasta sauce | <input checked="" type="checkbox"/> Breaded chicken strips |
| <input type="checkbox"/> Sugar-free gelatin              | <input type="checkbox"/> Sliced turkey                   | <input checked="" type="checkbox"/> Ketchup                |



As you know, the more you understand about your glucose patterns and act upon that knowledge, the better able you will be to manage your diabetes.

Unexplained high or low glucose can be troublesome. While an imbalance between insulin, food, and activity is most often the cause, there are several other factors to consider when pumping insulin and troubleshooting your glucose.

This chapter is designed to enhance your insulin pump problem-solving skills by providing strategies that will help you identify the problem, determine the cause, and find a solution to the unexpected.

Key topics include:

- Troubleshooting high and low glucose
- Troubleshooting infusion set concerns
- Managing time-off from your Tandem pump
- Managing sick days





# Troubleshooting

## Troubleshooting Your Glucose

When pumping insulin, you run the risk of highs and lows just as you did with manual injections. Many of these causes, like overeating or missing an insulin bolus, will be easy to identify, however some will be new to you.

The best way to know if your glucose is high or low is to monitor it frequently. If not using CGM, insulin pump users typically monitor their blood glucose at least four times a day, and more frequently when starting insulin pump therapy. Although you may not always be able to feel when your glucose is high or low, it is important to learn how to recognize the symptoms early. Let's review by working through the activity below.



Mark each symptom with either an **H** for high glucose, or **L** for low glucose.

|                                 |  |                                  |   |                                    |
|---------------------------------|--|----------------------------------|---|------------------------------------|
| Hungry <input type="checkbox"/> | Irritable <input type="checkbox"/>       | Nausea <input type="checkbox"/>  | Fast heartbeat <input type="checkbox"/> | Confusion <input type="checkbox"/> |
| Shaky <input type="checkbox"/>  | Blurred vision <input type="checkbox"/>  | Fatigue <input type="checkbox"/> | Extreme thirst <input type="checkbox"/> | Headache <input type="checkbox"/>  |
| Drowsy <input type="checkbox"/> | Urinating often <input type="checkbox"/> | Sweaty <input type="checkbox"/>  | Poor judgment <input type="checkbox"/>  | Anxious <input type="checkbox"/>   |

You may experience the same symptoms for both high and low glucose. It is also possible that you may have completely different symptoms or none at all. For this reason, it is best to monitor your glucose regularly to ensure that you are within your target goals.

## Hyperglycemia

Hyperglycemia (high glucose) occurs when there is too much glucose and not enough insulin in your blood. Stress, illness, medication, inactivity, and underestimation of carbohydrate consumed are all common causes of high glucose.

## Diabetic Ketoacidosis (DKA)

When insulin is not available, glucose can reach dangerous levels. If left untreated, DKA can lead to life-threatening conditions.

- DKA occurs when there is not enough insulin available to help glucose enter the cells to be used as energy.
- Without glucose, fat is used for energy, resulting in a waste product called ketones.
- If too many ketones accumulate (which can happen rapidly), the condition becomes very serious and medical attention is required. This is called DKA.
- Urine ketones can be checked with a visual test strip and ketones in the blood can be detected more quickly than urine using a specific blood ketone testing system and strips. Ask your healthcare professional when and how to test for ketones.

| Early Symptoms of DKA  | Symptoms of Severe DKA   |
|--|--|
| <ul style="list-style-type: none"> <li>• Thirst or dry mouth</li> <li>• Frequent urination</li> <li>• High glucose</li> <li>• Ketones</li> </ul> | <ul style="list-style-type: none"> <li>• Nausea and vomiting</li> <li>• Abdominal pain</li> <li>• Fatigue</li> <li>• Labored breathing</li> <li>• Fruity breath odor</li> <li>• Ketones</li> </ul> |

### To Prevent DKA:

- Monitor your glucose at least four to six times per day.
- Check for ketones anytime you have symptoms of DKA (see above).
- If your glucose is above 14 mmol/L two times in a row, follow Treatment Guidelines for Hyperglycemia on page 64.

### Be Prepared, Always Carry the Following Supplies:

- Insulin and syringes
- Ketone testing strips
- Glucose meter and strips
- Infusion sets and cartridges



### Checkpoint

What are the signs and symptoms of severe Diabetic Ketoacidosis?

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_
- 6) \_\_\_\_\_

# Troubleshooting



### Pump Tip

Your Tandem pump is equipped with a High Glucose Reminder that can be programmed to remind you to re-check your glucose following an episode of hyperglycemia. This feature is especially helpful when first starting pump therapy. Refer to your Pump User Guide to learn how to use this feature.



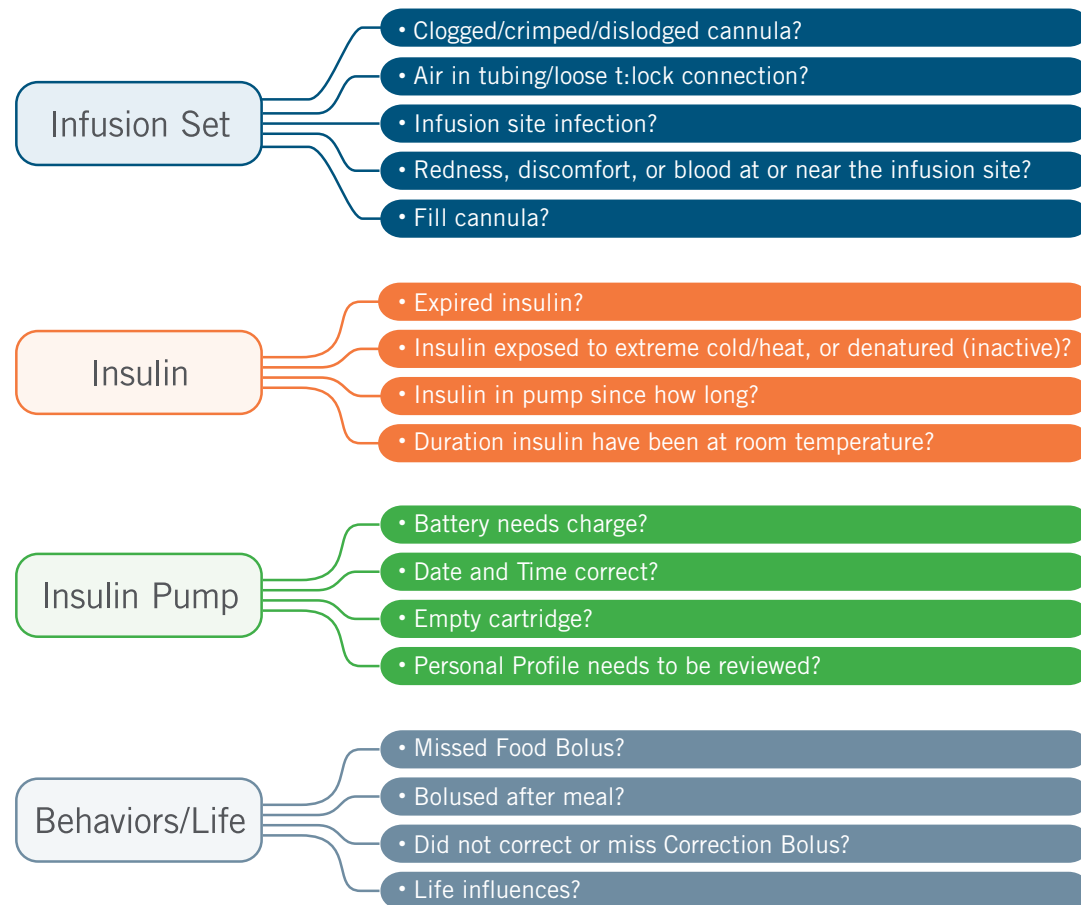
### Checkpoint

What are the four main categories to explore when troubleshooting hyperglycemia?

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_

## Troubleshooting Hyperglycemia

While insulin pump therapy offers many benefits, unexpected episodes of hyperglycemia can occur if insulin delivery is interrupted. In the absence of rapid-acting insulin and with no long-acting insulin available in your bloodstream (as before, when taking injections) your glucose can rise rapidly. The chart below outlines various troubleshooting categories that will need to be investigated when your glucose is not responding to a correction dose of insulin. If the problem continues or you do not find a solution, contact your healthcare provider.



## Hyperglycemia Troubleshooting Guide

| Possible Cause ↓                                     | What to Check ↓  | If Yes, Proceed with Action ↓  |
|--|--|--|
| <b>Infusion Set:</b>                                 |  |  |
| Leaking at the site                                  | Wetness at site  | Change infusion set at site. Rotate site.  |
| Not changed within 2-3 days                          | Load history or site reminder                                |  |
| Expired infusion set                                 | Package expiration date                                      |  |
| Infection at site                                    | Redness, swelling at site                                    |  |
| <b>Cannula:</b>                                      |  |  |
| Crimped, dislodged, or clogged                       | Infusion site  | Change infusion set at site. Rotate site.  |
| Placed in scar tissue                                |  |  |
| <b>Tubing:</b>                                       |  |  |
| Air bubbles  | Air bubbles or spaces in tubing                              | <b>Detach tubing from site;</b> fill tubing with insulin to push air out; reattach tubing to site.                               |
| Not filled when set was last changed                 | Load history   | <b>Detach tubing from site;</b> complete load sequence; reattach tubing to site.   |
| t:lock loose from tubing                             | t:lock/tubing connection                                     | <b>Detach tubing from site;</b> tighten t:lock at connection; fill tubing with insulin to push air out; reattach tubing at site. |
| <b>Insulin:</b>                                      |  |  |
| Expired or denatured (inactive)                      | Expiration date on insulin vial. Cloudy or clumpy appearance | Discard insulin vial. Fill new cartridge with new insulin. Change entire infusion set.   |
| Exposed to extreme cold, heat, or sunlight           | Insulin quality in vial. Storage temperature                 | Discard insulin and cartridge. Fill new cartridge with new insulin. Change entire infusion set.                                  |
| In cartridge longer than recommended                 | Load history   |  |
| <b>Insulin Pump:</b>                                 |  |  |
| Programming error (insulin dose settings, time/date) | Personal profiles, time/date settings                        | Reprogram as necessary.  |
| Alarm sounded  | Alarm history  | Identify alarm. Take action as outlined in Pump User Guide or call Customer Technical Support at (833) 509-3598.                 |
| Battery dead   | Battery icon   | Charge battery.  |
| Personal Profile need review                         | Discuss with your HCP  | Contact HCP to discuss need for evaluation and adjustments to settings.  |
| <b>Behaviors/Life:</b>                               |  |  |
| Missed bolus   | Bolus history  | Bolus as needed to correct.  |
| Bolused after meal                                   |  |  |
| Missed Correction Bolus                              |  |  |
| Life influences                                      | Stress, illness, medication, inactivity                      | Discuss action plan with HCP.  |

# Troubleshooting



### Pump Tip

When dosing by syringe and you want your Tandem pump to track IOB.

1. Disconnect your Tandem pump from your body.
2. Allow your Tandem pump to calculate the dose.
3. Deliver the bolus into the air.
4. Reconnect your Tandem pump to the infusion site.



### Training Tip

If your glucose is above 14 mmol/L two times in a row and/or is not responding to a Correction Bolus, test for ketones, change entire infusion set and site, correct by injection, and refer to Hyperglycemia Troubleshooting Guide on page 63.

## Treatment Guidelines for Hyperglycemia

If glucose is above target but below 14 mmol/L, take a Correction Bolus via your Tandem pump as directed. Recheck glucose in 1-2 hours. If glucose is not responding to treatment, test ketones (blood or urine) and follow guidelines below. If you cannot find a logical cause for the high glucose, check for ketones.

### If glucose remains above 14 mmol/L, or you have symptoms of DKA, test for ketones

| If ketones are negative:   | If ketones are positive:<br><i>(or, if glucose is not responding to Correction Bolus)</i>  |
|--|--|
| <ul style="list-style-type: none"> <li>• Change entire infusion set</li> <li>• Use correction factor to calculate and administer an insulin injection by syringe or pen.</li> <li>• Drink 1 to 1½ cups (250–375ml) of sugar-free fluids every 30 to 60 minutes to prevent dehydration.</li> <li>• Continue to monitor every 1–2 hours until glucose returns to normal.</li> <li>• If glucose is not responding to the Correction Bolus, follow procedure to the right for positive ketones.</li> </ul> | <ul style="list-style-type: none"> <li>• Use correction factor to calculate and administer an insulin injection by syringe or pen.</li> <li>• Change entire infusion set and site using a new cartridge and new insulin.</li> <li>• Drink 1 to 1½ cups (250–375ml) of sugar-free fluids every 30 to 60 minutes to prevent dehydration.</li> <li>• Continue to monitor every 1–2 hours until glucose returns to normal.</li> <li>• If glucose is not responding to treatment or if vomiting begins, contact your healthcare provider, go to ER, or call 911.</li> </ul> |

*(Adapted from Walsh, 2017)*

## Air in the Tubing

If air is present in the infusion set tubing, air will be delivered in place of your insulin dose. Hyperglycemia may result. Periodically check your tubing for air bubbles or gaps. Also check to ensure that the t:lock is tightly connected. If air is present in the tubing or if the t:lock connection is loose, take the following actions:

1. Disconnect tubing from the site.
2. Tighten t:lock connector.
3. Fill tubing with insulin to push air out.
4. Reattach tubing at site.



### What would you do?

For lunch you have the usual, a sandwich, potato chips, and a side salad. You enter your pre-meal glucose of 6.7 mmol/L and 56 grams of carbohydrate into your Tandem pump. You bolus as usual. Three hours after lunch, your glucose is 15 mmol/L. You are very busy at work, so you quickly bolus to correct. Two hours later, you feel nauseous and realize you have been urinating a lot. You check your glucose. It is now 22 mmol/L.

1. What should you do?
2. What do you think is the cause?
3. What could you have done differently?

*Note: Jot down your answers and discuss with your healthcare provider. Refer to page 73 for a discussion.*

Notes: \_\_\_\_\_

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**Pump Tip**

Your Tandem pump is equipped with a Low Glucose Reminder that can be programmed to remind you to re-check your glucose following an episode of hypoglycemia. To get the best use out of this feature, please enter all glucose values into your Tandem pump. Refer to your Pump User Guide to learn how to use this feature.

**Treatment Guidelines for Hypoglycemia**

Hypoglycemia (low blood glucose less than 4 mmol/L) occurs when there is too much insulin and not enough glucose in your blood. Some of the more common causes of hypoglycemia are increased or unexpected activity and overestimation of carbohydrate leading to a larger bolus than needed. Mild hypoglycemia is self-treated while a severe hypoglycemic reaction usually requires assistance.

You may experience one or more of the following:

- Shaky/trembling
- Sweating
- Dizziness
- Sudden hunger
- Confusion
- Irritability

**Treatment Guidelines for Mild Hypoglycemia**

- Self-treated by taking fast-acting carbohydrate following Rule of 15 (see below).
- Typically, symptoms do not occur until glucose drops below 3.9 mmol/L, however symptoms do vary in individuals.
- Some people are unable to recognize hypoglycemia, a condition called hypoglycemia unawareness. Talk to your healthcare provider if you feel this condition applies to you.

| Rule of 15 – When glucose is less than 3.9 mmol/L   |                                  |   |   |
|---|----------------------------------|---|---|
| Eat 15 grams of fast-acting carbohydrate  | Monitor glucose after 15 minutes | Repeat treatment if glucose is less than 3.9 mmol/L   | Repeat monitoring and treatment until glucose returns to normal range |
| Fast-Acting 15 Gram Carbohydrate Sources  |                                  |   |   |
| <ul style="list-style-type: none"> <li>• 3-4 glucose tablets</li> <li>• 1 tube of glucose gel (15 g)</li> <li>• 1/2 cup of juice or regular soft drink</li> <li>• 1 cup of skim milk</li> </ul> |                                  | <ul style="list-style-type: none"> <li>• 1 Tbsp of honey or syrup</li> <li>• 3 graham cracker squares</li> <li>• 6 saltine crackers</li> <li>• 2 Tbsp of raisins</li> </ul> |   |

*(Adapted from ADA, 2017)*

**Treatment Guidelines for Severe Hypoglycemia**

- Requires assistance. When hypoglycemia is severe, you may be unable to communicate treatment guidelines.
- Plan ahead. Wear medical identification and discuss a treatment plan with your friends, family members, and/or caregivers. They should be instructed to call 911 if you become unresponsive, unusually aggressive, unconscious, or have seizures.
- A glucagon emergency kit is used to treat severe hypoglycemia. It should be kept on hand. Glucagon can be administered either by an injection or delivered as a puff into the nose. It is important that you discuss this with your healthcare professional to see which is the best option for you. Regardless which method you choose, it is important that you review the steps on an annual basis and replace glucagon when expired.



List some factors that you believe may have caused hypoglycemia in the past.

- 1.
- 2.
- 3.

*Do you notice a trend? Discuss these causes with your healthcare provider if they continue.*

# Troubleshooting



## Checkpoint

What is used to treat a severe episode of hypoglycemia?

Answer

## Troubleshooting Hypoglycemia

Hypoglycemia is most often caused from too much insulin and not enough food. The guide below may help uncover some possible causes of hypoglycemia that you may have not considered.

### Hypoglycemia Troubleshooting Guide

| Cause   | Action  |
|---|---|
| Not allowing pump to calculate bolus  | • Bolus by entering grams of carbohydrate and glucose.  |
| Carbohydrate counting error   | • Refer to Chapter 4 for help with carbohydrate counting.   |
| Insulin stacking (correcting too soon or not using bolus calculator to correct) | • Enter all glucose readings into bolus calculator.   |
| Basal rate set too high   | • Discuss with your healthcare provider possible changes to your Personal Profile.  |
| Bolus calculator requires adjustment  | • Discuss with your healthcare provider possible changes to your insulin Personal Profile; Bolus settings.                      |
| Insulin duration setting needs adjustment                                       | • Discuss with your healthcare provider possible adjustment of insulin to carb ratio or correction factor (insulin sensitivity) |
| Exercise or activity  | • Discuss with your healthcare provider the use of a temp rate or an additional personal profile.                               |
| Alcohol   | • Refer to Chapter 4 for more information about alcohol and diabetes.   |

In most cases, it is not recommended that you stop insulin pump delivery when you experience hypoglycemia. Treat by following the Rule of 15 on page 66. If you continue to experience episodes of unexplained hypoglycemia, contact your healthcare provider for help determining the cause. It may be a matter of adjusting your insulin dose settings in your Personal Profile or improving your carbohydrate counting skills.

## Troubleshooting Your Infusion Set

It is always helpful to be aware of conditions that may contribute to infusion set issues. These include:

- Not using clean technique when inserting the infusion set
- Allergies or sensitivities to the cannula, adhesive, or dressing
- Improper site location selection
- The infusion set you are using may not be ideal for you. Discuss options with your healthcare provider.

Please discuss any recurrent infusion site problems with your healthcare provider.

### Infusion Set Troubleshooting Guide

| Problem                            | Action   |
|------------------------------------|--|
| Rash/itching                       | <ul style="list-style-type: none"> <li>• Consider that a new soap or lotion may be creating a reaction.</li> <li>• Cleanse the skin as usual and create a barrier using site preparation products. contact your healthcare provider regarding the best barrier product for you.</li> <li>• If this does not help, you may be allergic to the cannula, tape, or adhesive. Try changing them out one at a time to identify the problem.</li> </ul> |
| Skin bumps, scars, or pimples      | <ul style="list-style-type: none"> <li>• Replace the infusion set every 2–3 days.</li> <li>• Observe the site for infection (warm feeling, reddening, or discharge present).</li> <li>• Call your healthcare provider with signs and symptoms of infection and avoid placing infusion sets in these areas.</li> </ul>  |
| Poor sticking of adhesive at site  | <ul style="list-style-type: none"> <li>• Always make sure the site is clean and dry before inserting cannula.</li> <li>• Wipe site with a site preparation product and allow it to dry. Consider using a product such as Skin Prep or Skin Tac</li> </ul>  |
| Bleeding at site                   | <ul style="list-style-type: none"> <li>• Bleeding under the skin may cause a blood-filled sac to form.</li> <li>• If you feel a bump, remove immediately and insert a new infusion set at another site.</li> </ul>   |
| Blood in cannula or tubing         | <ul style="list-style-type: none"> <li>• Change out the infusion set and/or tubing.</li> <li>• Blood clotting can cause clogging which will interfere with insulin delivery.</li> </ul>  |
| Bruising at site                   | • Change the site location. Do not insert into a bruised area.   |
| Insulin leaking around site        | <ul style="list-style-type: none"> <li>• Change infusion set at site.</li> <li>• Try a longer cannula or one that inserts deeper into the skin.</li> </ul>   |
| High glucose following site change | <ul style="list-style-type: none"> <li>• Check that the tubing and cannula have been filled after inserting a new set.</li> <li>• Check for bubbles in the tubing.</li> <li>• You may choose to keep your old set in for 1–2 hours after inserting a new set to ensure that the prior bolus has been fully absorbed.</li> </ul>  |
| Repeated infusion set problems     | • Contact your healthcare provider to discuss a different type of infusion set.  |



**Training Tip**

Remember, long-acting insulin remains active in your body for 12 to 24 hours once it is injected. If you have replaced your basal insulin with long-acting insulin injections, make sure that all of the long-acting insulin has cleared your body before reconnecting to your Tandem pump and resuming basal delivery. Contact your healthcare provider for more information regarding the duration of your long-acting insulin and resuming basal delivery.

**Managing Time-Off From Your Tandem Pump**

It may be necessary to disconnect from your Tandem pump for a short period of time. For example, during contact sports, a day at the beach, a medical procedure, an insulin pump malfunction, or maybe you are just out of supplies. Check with your healthcare provider for specific instructions and a backup plan for time-off of your Tandem pump. Some general guidelines are provided below.

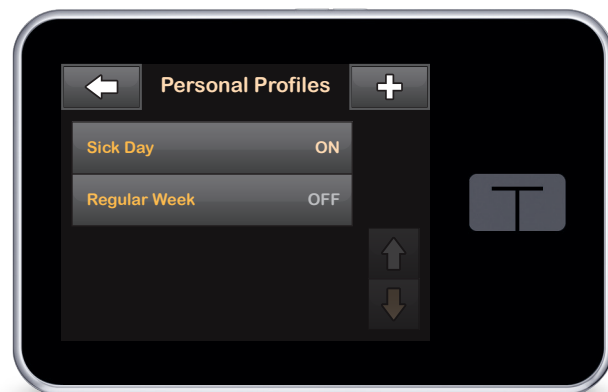
**Time-Off Pump Guide**

| Time-Off Pump  | Plan  |
|----------------|---|
| 1 hour or less | <ul style="list-style-type: none"> <li>Monitor glucose. Treat for high or low glucose as needed before disconnecting.</li> </ul>  |
| 1–4 hours      | <ul style="list-style-type: none"> <li>Determine the amount of time you will be disconnected from your pump.</li> <li>Bolus the calculated amount of missed basal insulin for that period. Reduce amount for activity if necessary.</li> <li>Remove your Tandem pump.</li> <li>Cover for carbohydrate by reconnecting to your Tandem pump or by injection.</li> </ul> |
| Over 4 hours   | <ul style="list-style-type: none"> <li>Refer to the backup plan agreed upon by your healthcare provider.</li> </ul>   |

**Managing Sick Days**

Special care needs to be taken when you become ill. Hormones released during illness or stress can rapidly increase glucose. By following a few simple guidelines, you can minimize the effect of an illness on your diabetes.

Be prepared. Plan ahead by stocking supplies and non-perishable food items. If you wait until you are sick, you may not have the energy to find what you need.



| Supplies to Keep on Hand  |
|---|
| Ketone testing strips   |
| Glucose testing supplies: meter, strips, lancets, meter batteries and CGM sensors |
| Rapid-acting insulin and syringes   |
| Thermometer   |
| Over-the-counter medications for colds, flu, diarrhea, vomiting                   |

| Foods to Keep on Hand |
|-----------------------|
| Sports drinks         |
| Fruit juice           |
| Regular and diet soda |
| Canned soup           |
| Crackers              |
| Regular gelatin       |
| Instant pudding       |
| Applesauce            |

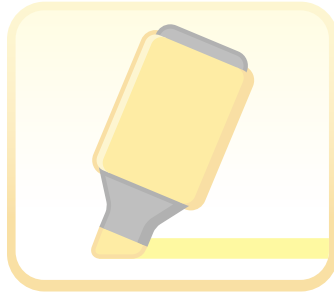
**Sick Day Action Plan**

- Do not stop Tandem pump insulin delivery. Continue taking insulin. You may need to use a temporary basal rate or create a Sick Day Personal Profile if more or less insulin is needed. Discuss this option with your healthcare provider.
- Monitor your glucose every 2-4 hours.
- Check ketones when glucose is over 14 mmol/L and anytime you have signs and symptoms of DKA including nausea or vomiting.
- Drink plenty of fluids. Choose water or decaffeinated, sugar-free fluids. Drink 1 to 1½ cups (250–375ml) every 30 to 60 minutes to keep from becoming dehydrated.
- Eat foods with carbohydrate. If you are unable to eat, alternate sugar-free fluids with fluids that contain carbohydrate, i.e., sports drinks, soda, and fruit juice. Bolus as needed to cover the carbohydrate.

**When to Call Your Healthcare Provider**

- If your glucose remains above 14 mmol/L and/or you have moderate to large ketones
- When you have persistent diarrhea
- If fever is over 38°C
- When you are vomiting and unable to take in fluids
- If you have severe abdominal pain
- When illness persists over 24 hours
- If you have unexplained symptoms





### Chapter Highlights

- Troubleshooting involves a series of problem-solving steps to determine a cause and find a solution for unexplained glucose.
- High glucose (hyperglycemia) may be caused from problems associated with your infusion set, insulin, your Tandem pump, or lifestyle/behaviors.
- When troubleshooting hyperglycemia refer to the troubleshooting guide on page 63.
- Hyperglycemia should be treated swiftly following guidelines provided on page 64.
- DKA is a life-threatening condition that can result when high glucose is left untreated. Symptoms include nausea, vomiting, fruity breath odor, and abdominal pain. Ketones are present. DKA requires immediate medical attention.
- Low blood sugar (hypoglycemia) may be the result of a miscalculated bolus, a carb counting error, or insulin stacking or unexpected activity.
- When experiencing hypoglycemia, using the Rule of 15: take 15 grams of fast-acting carbohydrate, wait 15 minutes, recheck glucose. Re-treat if necessary.
- Check with your healthcare provider for specific instructions and a backup plan if it may be necessary to disconnect from your Tandem pump for a short period of time.
- Keep supplies on hand for sick days. When ill, do not disconnect your Tandem pump. Check ketones, drink plenty of fluids, and if you are too ill to eat, replace meal carbohydrate with liquids containing carbohydrate.



### Checkpoint Answers

1. What are the signs and symptoms of severe DKA?  
*Answer: Ketones, nausea and vomiting, abdominal pain, fatigue, labored breathing, fruity breath odor*
2. What are the four main categories to explore when troubleshooting hyperglycemia?  
*Answer: Insulin, infusion set, Tandem pump, behaviors/life issues*
3. What is used to treat a severe episode of hypoglycemia?  
*Answer: Glucagon emergency kit*



### Activity Answer Key – High Glucose or Low Glucose

|                  |  |                 |  |
|------------------|--|-----------------|--|
| Hungry:          | <input checked="" type="checkbox"/> H, <input checked="" type="checkbox"/> L | Sweaty:         | <input type="checkbox"/> L   |
| Shaky:           | <input type="checkbox"/> L   | Fast heartbeat: | <input type="checkbox"/> L   |
| Drowsy:          | <input checked="" type="checkbox"/> H, <input checked="" type="checkbox"/> L | Extreme thirst: | <input checked="" type="checkbox"/> H  |
| Irritable:       | <input checked="" type="checkbox"/> H, <input checked="" type="checkbox"/> L | Poor judgment:  | <input type="checkbox"/> L   |
| Blurred vision:  | <input checked="" type="checkbox"/> H  | Confusion:      | <input checked="" type="checkbox"/> H, <input checked="" type="checkbox"/> L |
| Urinating often: | <input checked="" type="checkbox"/> H  | Headache:       | <input checked="" type="checkbox"/> H, <input checked="" type="checkbox"/> L |
| Nausea:          | <input checked="" type="checkbox"/> H  | Anxious:        | <input type="checkbox"/> L   |
| Fatigue:         | <input checked="" type="checkbox"/> H  |                 |  |

### Activity Answer Key – What Would You Do?

1. What should you do?  
*Answer: Check for ketones and follow the Treatment Guidelines for Hyperglycemia on page 64. Troubleshoot your Tandem pump and infusion set using the Troubleshooting Guides on pages 63 and 69.*
2. What do you think is the cause?  
*Answer: A number of reasons need to be explored; crimped or dislodged cannula, occlusion/clog in the tubing, empty cartridge, incomplete bolus.*
3. What could you have done differently?  
*Answer: Take action sooner. Do not delay. Nausea, frequent urination, and elevated glucose are warning signs of DKA. Follow the guidelines for treating and troubleshooting hyperglycemia.*

## Helpful Features

Exploring the features and capabilities of your Tandem pump will help you get the most out of insulin pump therapy.

Your Tandem Pump was designed to help you manage your diabetes by offering flexible options for customizing your basal and bolus insulin delivery; however, it is equipped with much more. To enhance your pumping experience, your Tandem pump offers additional features that will make living with diabetes more manageable and a little easier.

In this chapter, we will explore the benefits of using the following helpful features on your Tandem pump:

- Personal Profiles
- Temporary Basal Rate
- Extended Bolus
- Quick Bolus
- Missed Meal Bolus Reminder
- Infusion Set Site Reminder
- High and Low Glucose Reminders

*Note: Always refer to your Pump User Guide for detailed instructions on the use of these helpful features.*



# Helpful Features



### Training Tip

Discuss your individualized insulin needs with your healthcare provider to determine if this feature is right for you.

## Additional Personal Profiles

| What is it?   | Why use it?  | How do I use it?   |
|---|--|--|
| <ul style="list-style-type: none"> <li>A Personal Profile is a group of settings that define the basal and bolus delivery within specific time segments over a 24-hour period.</li> <li>You can create up to six different Personal Profiles with customized basal rates, carb ratios, correction factors, and target glucoses. Each unique Personal Profile can be identified by a name.</li> <li>You will always have one Personal Profile active.</li> </ul> | <ul style="list-style-type: none"> <li>When you have regular changes in your routine that will influence your glucose, i.e. summer camp, travel, etc.</li> <li>For regular changes in weekend activity.</li> <li>To adapt to shift work.</li> <li>For scheduled exercise or activity.</li> <li>For an ongoing illness or medical treatment.</li> <li>During monthly hormonal changes.</li> <li>When testing and evaluating insulin dose settings.</li> </ul> | <ul style="list-style-type: none"> <li>A Personal Profile must be programmed before it can be used (see Pump User Guide).</li> <li>Once the feature has been programmed, you can activate a Personal Profile at any time.</li> <li>To change to a different profile, simply access your Personal Profiles and select the desired profile.</li> </ul> |

### Pump in Practice

Cal is a banker during the week and Cal's weekend insulin requirements are far less than what is needed on weekdays at the office. To avoid hypoglycemia, Cal needs to decrease his basal rate(s) and reduce his bolus delivery by making adjustments to his carb ratio, correction factor, and target glucose. Cal utilizes a weekend Personal Profile on his Tandem pump by switching to a preset "Weekend" profile every Friday night and then back to his "Office" profile on Sunday evening. Using a customized profile, he doesn't have to constantly treat hypoglycemia or make changes to his regular "Office" profile. Now, Cal can enjoy his weekend activities without worrying about a low.



How would you use this feature?

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## Temp Rate

| What is it?  | Why use it?   | How do I use it?   |
|--|---|--|
| <ul style="list-style-type: none"> <li>The Temp Rate (temporary basal rate) feature allows you to temporarily increase or decrease your basal rate over a specified period of time.</li> <li>A basal rate can be modified for a period of 15 minutes to 72 hours at 0-250% of the programmed rate.</li> <li>At the end of the period, your standard basal rate will automatically resume.</li> </ul> | <ul style="list-style-type: none"> <li>Before, during, and after exercise or activity.</li> <li>During periods of stress or illness.</li> <li>During monthly hormonal changes.</li> <li>While taking certain medications.</li> <li>The time period following severe hypo or hyperglycemia.</li> <li>To assist in covering a high-fat or high-protein meal.</li> <li>For changes in normal activity, i.e. travel, outing, long conferences or meetings.</li> </ul> | <ul style="list-style-type: none"> <li>Identify a time in which a Temp Rate might be useful.</li> <li>Determine how you would like to change your standard basal delivery. An increase is shown as greater than 100%. A decrease is shown as less than 100% (see Pump User Guide).</li> <li>Start with only a 10-20% change. Make adjustments once you begin to identify a pattern to your glucose responses.</li> <li>Start Temp Rate 1-2 hours before the activity or event begins. End Temp Rate 1-2 hours after activity or event ends.</li> <li>Record any changes for future reference.</li> </ul> |

### Pump in Practice

Maria is going on a family road trip to vacation at the beach. Usually, she is very active and busy during the day. Having to sit in the car for six hours is very different from her normal daily routine. She is concerned that this prolonged inactivity will cause an increase in her glucose. Maria knows she will need more basal insulin while traveling. She decides to increase her basal rate by setting a Temp Rate on her Tandem pump at 110% for the next 6 hours. Thanks to the increase in her insulin delivery, Maria is able to keep her glucose at her target goal throughout the trip. Her vacation is off to a great start!



How would you use this feature?

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# Helpful Features



### Checkpoint

When using the Extended Bolus feature, which part of the bolus can you DELIVER LATER?

*Answer*



### Training Tip

You might find that different distributions of immediate delivery and extended delivery boluses work for different foods.

## Extended Bolus

| What is it?   | Why use it?  | How do I use it?  |
|---|--|---|
| <ul style="list-style-type: none"> <li>The Extended Bolus feature offers the option of delivering all or a portion of your Food Bolus over an extended period of time.</li> <li>You determine the percentage of the Food Bolus that you want delivered immediately and how much you want delivered over time.</li> <li>An Extended Bolus can be delivered for a period of 15 minutes to 8 hours.</li> </ul> | <ul style="list-style-type: none"> <li>When you want a slow infusion of your insulin bolus over time.</li> <li>When you eat a high-protein and/or high-fat meal (ie, steak or pizza).</li> <li>When you eat a large meal.</li> <li>When eating over an extended period of time like a banquet or party.</li> <li>If you suffer from slow digestion or have gastroparesis.</li> <li>If you decide that you do not want to eat the entire meal, you can cancel the bolus before it is delivered.</li> <li>For medications that affect your digestion.</li> </ul> | <ul style="list-style-type: none"> <li>When delivering a bolus, select Extended after entering grams of carb or units of insulin and before selecting Deliver (see Pump User Guide).</li> <li>Your Tandem pump will calculate and display 50% DELIVER NOW. You can confirm this amount or change the percentage of the amount for the Food Bolus you would like to DELIVER NOW.</li> <li>Your Tandem pump will then calculate the amount to DELIVER LATER (extended).</li> <li>Finally, you will be prompted to select the duration of time that the extended portion will be delivered.</li> </ul> |

### Pump in Practice

Lorenzo loves his wife's homemade lasagna. He knows that for every 4-inch [10 cm] square he plans to eat, he will enter 40 grams of carb into his Tandem pump and bolus accordingly. Because of the high amount of cheese (fat and protein) in the lasagna, the carbohydrate from the pasta is released into his bloodstream at a slower rate. As a result, Lorenzo's glucose drops shortly after the meal and later increases, remaining elevated well into the night. Now, Lorenzo uses the Extended Bolus feature on his Tandem pump for lasagna. He delivers 40% of the Food Bolus NOW and extends the remaining 60% over the next 4 hours. His wife's lasagna never tasted better!



How would you use this feature?

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## Quick Bolus

| What is it?   | Why use it?  | How do I use it?   |
|---|--|--|
| <ul style="list-style-type: none"> <li>A secondary way to deliver a bolus by following beep or vibration commands without navigating through or viewing your Tandem pump screen.</li> <li>This feature is programmed to deliver a bolus by entering increments of units of insulin or grams of carbohydrate.</li> <li>The Quick Bolus feature does NOT allow you to enter a glucose value to calculate a Correction Bolus.</li> </ul> | <ul style="list-style-type: none"> <li>When you want to deliver a bolus discreetly, without your insulin pump in view.</li> <li>When you have already calculated your insulin needs and just want to quickly deliver a bolus.</li> <li>When your Tandem pump is not worn in an easily accessible place.</li> </ul> | <ul style="list-style-type: none"> <li>The Quick Bolus feature must be turned on and programmed before using (see Pump User Guide).</li> <li>Once the feature has been programmed, simply press and hold the Quick Bolus button to activate the function.</li> <li>Next, press the button for each increment until the desired amount is reached.</li> <li>Wait for the confirmation feedback and then press the Quick Bolus button again to deliver.</li> </ul> |

### Pump in Practice

Lara is busy at a working lunch meeting. She wants to eat a half of a bagel but does not want to remove her Tandem pump from under her clothing to navigate delivering a bolus. Lara can easily access the Quick Bolus button through her clothing. By following vibration commands, she can accurately enter the 30 grams needed to cover the bagel into her Tandem pump without disrupting the meeting or bringing attention to herself.



How would you use this feature?

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### Pump Tip

When first using the Quick Bolus feature, practice by viewing the screen until you become familiar with the process.

Missed Meal Bolus Reminder

| What is it?   | Why use it?  | How do I use it?   |
|---|--|--|
| <ul style="list-style-type: none"> <li>The Missed Meal Bolus Reminder offers the option of programming a personalized alert that will notify you of a possible Missed Meal Bolus.</li> <li>If a bolus is not delivered during that time period, your Tandem pump will alert, reminding you that a possible Missed Meal Bolus has occurred.</li> </ul> | <ul style="list-style-type: none"> <li>If you frequently forget to bolus for a meal.</li> <li>When life gets busy and you simply forget to bolus for a meal or a snack.</li> <li>To minimize the risk of high glucose following a meal.</li> </ul> | <ul style="list-style-type: none"> <li>The Missed Meal Bolus Reminder must be turned on before using (see Pump User Guide).</li> <li>To program, select the day(s) of the week and the time frame (starting and ending) that you would like to be reminded.</li> <li>Your Tandem pump will alert you at the end of the time frame if no bolus has been delivered.</li> </ul> |

Pump in Practice

Will is usually home from school around 3 PM every day. He typically eats a snack, but often forgets to bolus for that snack because he quickly gets busy with homework and other projects.

To avoid the resulting high glucose from a missed bolus, Will sets a Missed Meal Bolus Alert from 3-4 PM every day. If he forgets to bolus by 4 PM, his Tandem pump will alert to remind him of a possible Missed Meal Bolus. Now, Will no longer struggles with high glucose before dinner.



How would you use this feature?

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Site Reminder

| What is it?  | Why use it?  | How do I use it?   |
|--|--|--|
| <ul style="list-style-type: none"> <li>The Site Reminder is a programmable setting that reminds you when it is time to change your infusion set.</li> <li>You can select the time and date that you would like your Tandem pump to remind you to change your infusion set.</li> <li>Keep in mind, there may be times you will need to change the infusion set before the reminder alerts.</li> </ul> | <ul style="list-style-type: none"> <li>To remind you to change your infusion set every 2-3 days.</li> <li>As a safety measure to reduce the risk of developing a site infection.</li> <li>As a safety measure to maintain insulin stability and absorption.</li> </ul> | <ul style="list-style-type: none"> <li>The Site Reminder must be turned on before use (see Pump User Guide).</li> <li>This feature can be accessed and programmed from the Load Menu.</li> <li>In the Load Menu, select Site Reminder on. Select Edit Reminder, then select the number of days and the time that you would like to be reminded to change your infusion set.</li> </ul> |

Pump in Practice

Sam works shifts. Alternating days and nights, it's easy to forget the day of the week, much less when to change his infusion set. Life is busy at home as well. Sam often forgets to change his infusion set and notices high glucose or irritation at his site after three days of use. His diabetes management is in poor control.

Sam sets the Site Reminder in his Tandem pump to alert him when it is time to change his infusion set. Now, he never forgets to change his infusion set and avoids the problems he had in the past. His glucose control is looking much better.



How would you use this feature?

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Checkpoint

Before using the Reminders in your Tandem pump, they must be turned on and programmed.

TRUE or FALSE

# Helpful Features



### Training Tip

Discuss your individualized insulin needs with your healthcare provider to determine if this feature is right for you.

## High and Low Glucose Reminders

| What is it?   | Why use it?  | How do I use it?   |
|---|--|--|
| <ul style="list-style-type: none"> <li>Glucose Reminders can be set to remind you to monitor your glucose within a specific time following a high or low glucose event.</li> <li>A Low Glucose Reminder can be set to alert in 10-20 minutes.</li> <li>A High Glucose Reminder can be set to alert in 1-3 hours.</li> </ul> | <ul style="list-style-type: none"> <li>As a safety measure to ensure that glucose is returning to normal.</li> <li>When new to pumping.</li> <li>To determine if you need to re-treat a low glucose reaction with a fast-acting carb or re-treat a high glucose with a correction dose.</li> <li>To troubleshoot high or low glucose.</li> </ul> | <ul style="list-style-type: none"> <li>The Glucose Reminder feature must be turned on and programmed before using (see Pump User Guide).</li> <li>Once the feature has been programmed, it will automatically alert you to monitor your glucose at the set time period.</li> </ul> |

### Pump in Practice

Ali is following up with her diabetes educator today. At her last visit, it was found that her A1C had risen 1.2 percentage points over the last three months. Ali's glucose logs revealed that she often did not recheck her glucose following a high event.

At that time, Ali's diabetes educator suggested that she utilize the High Glucose Reminder in her Tandem pump. She set the reminder to alert 1 hour following a glucose of greater than 11.1 mmol/L. Good news today! Ali's A1C has returned to a healthy A1C goal.



Match each case scenario with the Tandem pump feature that you feel would be the best choice.

|                          |   |                               |
|--------------------------|---|-------------------------------|
| <input type="checkbox"/> | 1. You develop a fever and your glucose is difficult to control.  | A. Site Change Reminder       |
| <input type="checkbox"/> | 2. You have a hard time keeping track of your last infusion set change.   | B. Temp Rate                  |
| <input type="checkbox"/> | 3. Your Tandem pump is hidden in your formal wear, and it is time to eat dinner.  | C. Personal Profiles          |
| <input type="checkbox"/> | 4. You often work through lunch and find that you frequently forget your meal bolus.  | D. Extended Bolus             |
| <input type="checkbox"/> | 5. You are at a friend's house "grazing" on pizza and other high-fat food.  | E. High Glucose Reminder      |
| <input type="checkbox"/> | 6. You are new to pumping. You just checked your glucose and it is 15.3 mmol/L. It is time for bed.                         | F. Missed Meal Bolus Reminder |
| <input type="checkbox"/> | 7. You are planning a five-day hiking and camping trip and are concerned that the activity will cause your glucose to drop. | G. Quick Bolus                |



How would you use this feature?

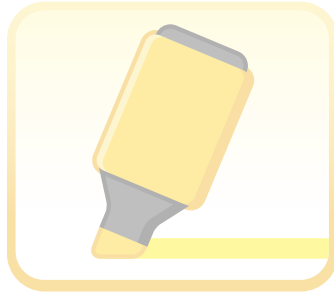
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## Helpful Features



## Chapter Highlights

- Your Tandem pump is equipped with a variety of helpful, easy-to-use features that make managing your diabetes a little simpler.
- Personal Profiles define your insulin delivery and insulin dose settings. You can program up to six easily accessible profiles customized by settings and personalized by names.
- A Temp Rate allows you to increase or decrease your basal delivery short-term, from 15 minutes to 72 hours.
- The Extended Bolus feature offers the option of slowing down the release of a meal bolus to better match insulin to foods that are harder to digest or when eating over an extended period.
- The Quick Bolus is another way to deliver a bolus without navigating through or viewing the screen.
- The Missed Meal Bolus Reminder alerts you when a meal bolus was not delivered during a specified period of time.
- The Site Reminder keeps track of your last infusion set change. It can be programmed to remind you to change your infusion site by day and time of day.
- The High and Low Glucose Reminders can be set to remind you to re-check your glucose within a specified time following a high or low glucose event.



## Checkpoint Answers

1. When using the Extended Bolus feature, which part of the bolus can you DELIVER LATER?  
*Answer: Food Bolus*
2. Before using the Reminders in your Tandem pump, they must be turned on and programmed.  
*Answer: True*



## Activity Answer Key – Match Each Case Scenario

1. You develop a fever and your glucose is difficult to control.  
*Answer: (B) Temp Rate*
2. You have a hard time keeping track of your last infusion set change.  
*Answer: (A) Site Change Reminder*
3. Your Tandem pump is hidden in your formal wear, and it is time to eat dinner.  
*Answer: (G) Quick Bolus*
4. You often work through lunch and find that you frequently forget your meal bolus.  
*Answer: (F) Missed Meal Bolus Reminder*
5. You are at a friend's house "grazing" on pizza and other high-fat food.  
*Answer: (D) Extended Bolus*
6. You are new to pumping. You just checked your glucose and it is 15.3 mmol/L. It is time for bed.  
*Answer: (E) High Glucose Reminder*
7. You are planning a five-day hiking and camping trip and are concerned that the activity will cause your glucose to drop.  
*Answer: (C) Personal Profiles*

## Quick Reference Guides

Diabetes management and insulin pump therapy may seem overwhelming at times. Eventually, they will become second nature. Even still, life may throw you a curve ball. Having a plan will keep you prepared and help reduce anxiety when the unexpected happens.

An inventory of diabetes supplies and treatment guidelines for high and low glucose were provided in previous chapters. This section is designed to make these references easily accessible to you in one location. You will also find quick reference guidelines for how to handle time-off of your Tandem pump. Remember to always discuss your individualized insulin needs with your healthcare provider.

### Supplies to Carry and Keep on Hand

| Carry Every Day  | Keep at Home   | Traveling and Emergencies   |
|--|--|---|
| <ul style="list-style-type: none"> <li>• Glucose testing supplies: meter, strips, lancets, meter batteries</li> <li>• Fast-acting carbohydrate for low glucose</li> <li>• Extra snack for longer coverage than fast-acting carbohydrate</li> <li>• Glucagon emergency kit (for recurrent, severe hypoglycemia)</li> <li>• Rapid-acting insulin and syringes</li> <li>• Infusion sets (a minimum of two)</li> <li>• Insulin pump cartridges (a minimum of two)</li> <li>• Infusion site preparation products (antiseptic wipes, skin adhesive)</li> <li>• Ketone testing strips</li> <li>• CGM supplies (if using)</li> <li>• Diabetes identification card or jewelry</li> <li>• Tandem pump USB cable</li> </ul> | <ul style="list-style-type: none"> <li>• Glucose testing supplies: meter, strips, lancets, meter batteries</li> <li>• Fast-acting carbohydrate for low glucose</li> <li>• Extra snacks for longer coverage than fast-acting carbohydrate</li> <li>• Glucagon emergency kit</li> <li>• Rapid-acting insulin and syringes</li> <li>• At least one full box of infusion sets and insulin cartridges</li> <li>• Infusion site preparation products (antiseptic wipes, skin adhesive)</li> <li>• Ketone testing strips</li> <li>• Long-acting insulin, or a prescription in case you need to be without your Tandem pump for a period of time.</li> <li>• A written plan describing how to cover yourself with injections if you need to be without your Tandem pump for a period of time. Discuss this backup plan with your healthcare provider.</li> <li>• Tandem pump USB cable</li> <li>• CGM supplies (if using)</li> </ul> | <ul style="list-style-type: none"> <li>• Your everyday supplies carry kit</li> <li>• Estimate how many cartridges and infusion sets you will need; take 2-3 times this amount</li> <li>• Additional rapid-acting insulin and a prescription</li> <li>• Long-acting insulin, or a prescription</li> <li>• A written plan describing how to cover yourself with injections if you need to be without your Tandem pump for a period of time. Discuss this backup plan with your healthcare provider.</li> <li>• Tandem pump USB cable</li> <li>• CGM supplies (if using)</li> </ul> <p><b>Emergency Preparedness/ Evacuation Planning</b></p> <ul style="list-style-type: none"> <li>• Supplies for travel (plus more than you would need under normal circumstances)</li> <li>• Cooler or cooling pack for insulin</li> </ul> |

### Sick Day Supplies

| Supplies to Keep on Hand  | Foods to Keep on Hand  |
|---|--|
| <ul style="list-style-type: none"> <li>• Ketone testing strips</li> <li>• Glucose testing supplies: meter, strips, lancets, meter batteries</li> <li>• Rapid-acting insulin and syringes</li> <li>• Thermometer</li> <li>• Over-the-counter medications for colds, flu, diarrhea, vomiting</li> </ul> | <ul style="list-style-type: none"> <li>• Sports drinks</li> <li>• Fruit juice</li> <li>• Regular and diet soda</li> <li>• Canned soup</li> <li>• Regular gelatin</li> <li>• Instant pudding</li> <li>• Applesauce</li> <li>• Crackers</li> </ul> |

### Time-Off Pump

It may be necessary to disconnect from your Tandem pump for a short period of time during certain activities such as contact sports, a day at the beach, a medical procedure, an insulin pump malfunction, or maybe you are just out of supplies. Check with your healthcare provider for specific instructions and a backup plan for time-off of your Tandem pump. Some general guidelines are provided below.

| Time-Off Your Tandem Pump | Plan   |
|---------------------------|--|
| 1 hour or less            | Monitor glucose. Treat for high or low glucose as needed before disconnecting.   |
| 1–4 hours                 | Determine amount of time to disconnect from Tandem pump. Bolus the calculated amount of missed basal insulin for that period. Reduce amount for activity, if necessary. Remove your Tandem pump. Cover carbohydrate by reconnecting to pump or by injection. |
| Over 4 hours              | Refer to your backup plan agreed upon by your healthcare provider.   |

## Quick Reference Guides

### Treatment Guidelines for Hyperglycemia

If glucose is above target but below 14 mmol/L, take a Correction Bolus via your Tandem pump as directed. Recheck glucose in 1-2 hours.

If glucose is not responding to treatment, test ketones (blood or urine) and follow guidelines below.

If glucose remains above 14 mmol/L, or you have symptoms of diabetic ketoacidosis (DKA), test for ketones

| If Ketones are Negative:   | If Ketones are Positive:<br><i>(or, if glucose is not responding to Correction Bolus)</i>  |
|--|--|
| <ul style="list-style-type: none"> <li>• Visually inspect entire infusion set and site. Correct any problems if identified. See Troubleshooting Guide on page 63.</li> <li>• Use correction factor to calculate and administer an insulin injection by syringe or pen.</li> <li>• Drink 1 to 1½ cups (250–375ml) of sugar-free fluids every 30 to 60 minutes to prevent dehydration.</li> <li>• Continue to monitor every 1-2 hours until glucose returns to normal.</li> <li>• If glucose is not responding to the Correction Bolus, follow procedure to the right for positive ketones.</li> </ul> | <ul style="list-style-type: none"> <li>• Use correction factor to calculate and administer an insulin injection by syringe or pen.</li> <li>• Change entire infusion set and site using a new cartridge and new insulin.</li> <li>• Drink 1 to 1½ cups (250–375ml) of sugar-free fluids every 30 to 60 minutes to prevent dehydration.</li> <li>• Continue to monitor every 1-2 hours until glucose returns to normal.</li> <li>• If glucose is not responding to treatment or if vomiting begins, contact your healthcare provider, go to ER, or call 911.</li> </ul> |

If your glucose is above 14 mmol/L two times in a row and/or is not responding to a Correction Bolus, test for ketones, change entire infusion set and site, correct by injection, and refer to Hyperglycemia Troubleshooting Guide on page 63.

*(Adapted from Walsh, 2017)*

### Treatment Guidelines for Hypoglycemia

| Mild Hypoglycemia   | Severe Hypoglycemia  |
|---|--|
| <p>Self-treated by eating carbohydrate. Follow the 15-15 rule.</p> <ol style="list-style-type: none"> <li>1. Eat 15 grams of fast-acting carbohydrate.</li> <li>2. Monitor glucose after 15 minutes.</li> <li>3. Repeat treatment if glucose is less than 3.9 mmol/L.</li> <li>4. Repeat monitoring and treatment until glucose returns to normal range. Once your glucose is back to normal, eat a meal or snack to make sure it doesn't lower again.</li> </ol> | <ul style="list-style-type: none"> <li>• Typically requires assistance. Discuss a treatment plan with your friends, family members, and/or caregivers. They should be instructed to call 911 if you become unresponsive, combative (unusually aggressive), unconscious, or have seizures.</li> <li>• Injectable or intra nasal glucagon is used to treat someone with diabetes when their glucose is too low to treat using the 15-15 rule. Glucagon kits are available by prescription. Speak with your doctor about whether you should buy a glucagon kit and how and when to use it.</li> </ul> |

*(Adapted from ADA, 2019)*

Notes: \_\_\_\_\_

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## Glossary

**Basal** – A slow, continuous delivery of insulin that keeps the glucose stable between meals and during sleep. A basal rate is measured in units per hour.

**Basal Testing** – A process of testing basal rates to determine if changes are needed and to customize basal rate settings.

**Bolus** – A quick dose of insulin that is usually delivered to cover food eaten or a high glucose. It is measured in units of insulin that are intended to match the amount of carbs that have been consumed.

**Cannula** – The section of the infusion set that is inserted under the skin through which insulin is delivered.

**Carb Choice** – A food item that contains approximately 15 grams of carbohydrate per serving.

**Carb Ratio (Insulin-to-Carbohydrate Ratio)** – The grams of carbohydrate that 1 unit of insulin will cover.

**Carbohydrate (Carb)** – Sugars and starches that the body breaks down to glucose and uses as an energy source, measured in grams.

**Carbohydrate Counting** – A method of meal planning based on counting the grams of carbohydrate in food.

**Cartridge** – The area of the Tandem pump that holds the insulin.

**Continuous Glucose Monitor (CGM)** – A device consisting of a sensor inserted under the skin that sends glucose readings to a receiver.

**Correction Bolus** – A dose of insulin given to correct elevated glucose.

**Correction Factor (Insulin Sensitivity Factor)** – The amount of glucose that is lowered by 1 unit of insulin.

**Diabetic Ketoacidosis (DKA)** – An emergency condition in which extremely high glucose levels, along with a severe lack of insulin, result in the breakdown of body fat for energy and an accumulation of ketones in the blood and urine.

**Insulin Duration** – The amount of time that insulin is active and available in the body after a bolus has been delivered. It is also used in the calculation for insulin on board (IOB).

**Extended Bolus** – A bolus that is delivered over a set period of time.

**Gastroparesis** – A condition that slows stomach emptying and digestion.

**Glucagon Emergency Kit** – A kit containing glucagon (a hormone that quickly increases glucose) and a syringe used to treat severe hypoglycemia. Glucagon requires a prescription and is administered as an injection, usually by someone else.

**Glucose (BG)** – The substance measured in blood or serous fluid by blood glucose meters and continuous glucose monitors, also known as “blood sugar.”

**Glucose Reminder** – An insulin pump feature that can be set to remind the user to check glucose within a specific time following a high or low glucose event.

**Glycemic Index** – A system that ranks carbohydrate foods according to how much they raise glucose compared with a reference food.

**Glycemic Load** – A system that considers both serving size and the Glycemic Index to determine the food’s effect on glucose.

**Glycogen** – The stored form of glucose found in the liver and muscles.

**Hyperglycemia** – High glucose.

**Hypoglycemia** – Low glucose.

## Glossary

**Hypoglycemia Unawareness** – A state in which a person does not feel or recognize the symptoms of low glucose.

**Infusion Set** – A complete tubing system that is attached to the end of the cartridge of the insulin pump and connects to the body at the infusion site through which insulin is delivered.

**Infusion Site** – The area on the body into which the cannula and needle are inserted.

**Insertion Device** – A device used to insert the cannula under the skin.

**Insulin on Board (IOB)** – Reflects how much insulin is remaining in the body from a previous bolus (or boluses) that will continue to lower glucose. It is also referred to as active insulin or bolus on board.

**Insulin Stacking** – Occurs when multiple boluses of insulin accumulate in the blood and may lead to hypoglycemia.

**Introducer Needle** – A small needle used to insert the cannula under the skin and is removed after insertion.

**Ketones** – A waste product that accumulates when glucose is not available and fat is used for energy.

**Missed Meal Bolus Reminder** – A programmable setting to notify the user of a possible Missed Meal Bolus.

**Net Carbs (Impact Carbs, Active Carbs)** – Terms used on food labels indicating that all of the fibre and sugar alcohol have been subtracted from the Total Carbohydrate. These terms are not regulated by the FDA.

**Personal Profile** – A personalized group of settings that define the delivery of basal and bolus insulin within specific time segments throughout a 24-hour period.

**PIE Format** – A three-step process (Prepare, Investigate, Evaluate) designed for testing and fine-tuning insulin dose settings.

**Quick Bolus** – A secondary way to deliver a bolus by following vibration and beep commands without navigating through or viewing the insulin pump screen.

**Site Reminder** – A programmable setting to remind the pump user when it is time for an infusion set to be changed.

**Sugar Alcohol** – Reduced calorie sweeteners that are slowly absorbed and poorly digested.

**USB Cable** – The Universal Serial Bus (USB) cord that is used to charge the Tandem pump battery.

**Target Glucose** – A specific glucose goal used to calculate a Correction Bolus.

**Temporary Rate** – A feature in the insulin pump that allows a short-term adjustment to the basal rate.

**Time Segments** – Specific time periods within a Personal Profile where basal rates, correction factors, carb ratios, and target glucose values are set.

**t:lock connector** – Connects and locks the infusion set tubing to the insulin pump cartridge.

**Tubing** – A flexible tube that allows insulin to flow from the pump to the infusion site.

**Units (of insulin)** – Measurement of insulin.



## Your Resource Guide

## Organizations

| Name  | Website                        |
|---|--------------------------------|
| BC Children's Hospital  | bcchildrens.ca                 |
| Canadian Nutrient File Database   | canada.ca                      |
| CDECB board   | cdec.ca                        |
| Children with Diabetes  | childrenwithdiabetes.com       |
| Connected in Motion / Exercise  | connectedinmotion.ca           |
| Diabetes at School  | diabetesatschool.ca            |
| Diabetes Canada   | diabetes.ca                    |
| Diabète-Québec  | diabete.qc.ca                  |
| Fondation pour enfants diabétiques du Québec FRED / The Diabetic Children's Foundation/ supports children and teens in Québec | diabetes-children.ca           |
| JDRF - formerly the Juvenile Diabetes Research Foundation   | jdrf.ca                        |
| John Walsh's site / packed with resources, tips, and articles   | diabetesnet.com                |
| Medic Alert   | medicalert.ca                  |
| Sick Kids - provides information about kids' health   | aboutkidshealth.ca             |
| Type1better / registry, support platform and studies  | type1better.com                |
| Type1Together / resources   | type1together.ca/resources.php |

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*Diabetes Forecast Magazine*                      diabetesforecast.org

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*Diabetic Living Magazine*                      diabeticlivingonline.com

*Diabetes Self-Management Magazine*                      diabetesselfmanagement.com

*Diabetes Net*    diabetesnet.com



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[tandemdiabetes.ca](http://tandemdiabetes.ca)



**Important Safety Information:** The t:slim X2 insulin pump is intended for the subcutaneous delivery of insulin, at set and variable rates, for the management of diabetes mellitus in persons requiring insulin. The pump is able to reliably and securely communicate with compatible, digitally connected devices. The pump is indicated for use in individuals six years of age and greater. The pump is intended for single patient, home use and requires a prescription in certain countries. The pump is indicated for use with NovoRapid or Humalog U-100 insulin. The System is not indicated for use in pregnant women, people on dialysis, or critically ill patients. Users of the pump and the System must: be willing and able to use the insulin pump, CGM, and all other system components in accordance with their respective instructions for use; test blood glucose levels as recommended by their healthcare provider; demonstrate adequate carb-counting skills; maintain sufficient diabetes self-care skills; see healthcare provider(s) regularly; and have adequate vision and/or hearing to recognize all functions of the pump, including alerts. The t:slim X2 pump, and the CGM transmitter and sensor must be removed before MRI, CT, or diathermy treatment. For additional important safety information, visit [tandemdiabetes.com/safetyinfo](http://tandemdiabetes.com/safetyinfo).

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