

My insulin pump workbook.



Welcome to insulin pump therapy and to the Animas family!

At Animas Corporation, we are committed to making your transition to pump therapy as easy as possible.

You may have chosen pump therapy for tighter control, to decrease the occurrence and/or severity of high and low blood glucose (BG) or to help you live a more active and flexible lifestyle. Whatever the reason, having a sound knowledge base about pump therapy will help you be successful in your personal goals. This workbook was designed to enhance your understanding of the basics of pump therapy, as well as your Animas® or OneTouch® pump (collectively referred to as “Animas® pump” throughout this workbook).

In addition to this workbook, you will have support from your healthcare professional (HCP) team (which could include your physician, physician assistant, nurse practitioner, pharmacist, and/or your nurse and dietitian diabetes educator) and your Animas Clinical team.

If you have any questions, call Animas Corporation at 1-877-YES-PUMP (1-877-937-7867) and we'll provide you with the name and telephone number of your local Animas Clinical team member.

Good Luck!

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This workbook highlights sections with special information to enhance your knowledge. Be sure to look for:



Test Your Knowledge: exercises or material covered in that section



Animas Important Pump Information: special information and tips about pumping

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Section 1: Introduction to pumping

Great expectations.

This section will cover realistic expectations about pump therapy and help you define your personal goals.

You have probably heard a lot about pump therapy from your physician, diabetes educator, other pumpers and the internet. With all this information, it may be helpful to think about your personal goals for pump therapy before you begin your training.

Take a minute to do the following activity. Place a check mark in front of the statements below that you believe apply to starting pump therapy:

- ____ 1. I will probably feel better on a pump than on injections.
- ____ 2. I won't have to carry diabetes "stuff" anymore.
- ____ 3. I will have more flexibility with my meal schedule.
- ____ 4. I can eat whatever I want.
- ____ 5. I won't have to check my blood glucose (BG) as frequently since the pump will keep my BG stable.
- ____ 6. I will be "fine-tuned" within a week of starting.
- ____ 7. I will have better BG control.
- ____ 8. Now that I have my pump, I should be pumping any day now.
- ____ 9. I won't have the highs and lows like I did on injections.
- ____ 10. It will take several weeks to months to adjust to pump therapy.

If you checked numbers 1, 3, 7, and 10, you have reasonable expectations of pump therapy. If you checked numbers 2, 4, 5, 6, 8, and 9, you should have further discussions with your physician, diabetes educator and/or pump trainer before getting started.

It is a good idea to review your concerns and/or questions with your diabetes educator and/or pump trainer so they can provide more information and guidance.



To do now:

List:

Two goals I hope to achieve by pumping: _____

My concerns about starting on a pump: _____

General questions about pump therapy: _____

Pre-pump topics.

The most successful pumpers have a good understanding of insulin pump therapy before they start pumping! This section includes a brief overview of important topics to help your transition to pump therapy go more smoothly.

Topics covered in this section include:

- What Pumpers Should Know
- Pump Therapy Overview
- Basal Rate Details
- Bolus Dose Details
- Counting Carbohydrates

What Pumpers Should Know

It is very important that you are comfortable with the mechanics of your pump and that you have a basic understanding of diabetes management before you start pumping. Even if you have had diabetes for many years, you will need to learn a lot of new information before you begin pump therapy, including:

- ___ The concept of basal/bolus insulin therapy
- ___ Insulin action: when your insulin starts working, works its hardest, and how long it lasts
- ___ Carbohydrate counting
- ___ Self-monitoring of blood glucose (SMBG): how often and when to check
- ___ What causes high BG
- ___ What causes low BG
- ___ Treating high BG
- ___ Treating low BG
- ___ Ketones: what they are and when to check for them
- ___ Managing BG for sick days
- ___ Managing BG for changes in activity
- ___ Detailed record keeping
- ___ Inserting an infusion set
- ___ Programming/using your insulin pump

Whoa! That's quite a list, but don't let it overwhelm you. Starting pump therapy is a process which often requires several education or training sessions. Your diabetes educator, Animas Clinical manager and/or pump trainer will help with the tools and information you need to be a successful pumper. This workbook is a great place to start! Even if you know a great deal about diabetes management, you will still need to learn how to apply your knowledge specifically to pump therapy. For example, although you have been treating high BG while on injections, you will need to adjust this plan once you begin pumping.



To do now:

Go back to the list of topics on the previous page. Put a check mark in front of the topics you are familiar with.

Make sure you discuss this list with your diabetes educator and/or pump trainer before you begin pump therapy.

Pump Therapy Overview

Animas[®] insulin pumps are devices which are about the size of a cell phone. They contain a cartridge filled with rapid-acting insulin. They have a screen and buttons for programming the pump's internal computer and a precise motor that pushes insulin from the cartridge through tubing and an infusion set into your body. An infusion set delivers insulin just beneath the skin through a small flexible tube called a cannula. Tubing connects the cartridge in the pump to the infusion set on your body. To meet your personal needs, infusion sets come in a variety of cannula and tubing lengths.

Pumps use only rapid-acting insulin. The most common types of insulin used in pumps are: NovoLog[®] and Humalog[®].

Rapid-acting insulin:

- _____ Starts working almost immediately after it is injected
- _____ Peaks (or works its hardest) about 1 to 1-1/2 hours after injected.
- _____ Stops working around 3-5 hours after injected. This is referred to as the duration of action.

The times noted above are approximate and may differ in individuals.

(See Appendix 1 for more information on insulin.)

Your pump delivers insulin two ways:

Basal Insulin: The continuous amount of insulin delivered automatically throughout the day and night. This is called your basal rate.

Bolus Insulin: The extra insulin you deliver when you eat carbohydrates ("carbs") or to correct a high BG. With input from your healthcare professional (HCP), you determine the amount of insulin needed and program these doses when you need them.

NovoLog[®] is a registered trademark of Novo Nordisk A/S. Humalog[®] is a registered trademark of Eli Lilly and company.

Basal Insulin

Your body needs insulin continually throughout the day, even when you are not eating and when you are sleeping. Basal insulin helps you maintain normal BG levels between meals and overnight. The long-acting insulin that you may have taken by injection before starting on pump therapy was your basal insulin. When using a pump, the basal rate will automatically deliver a steady flow of fast-acting insulin that will replace the long-acting insulin you took when you were on shots.

Initially your HCP will estimate how much basal insulin you need. Your basal rate(s) will most likely need to be adjusted once you start pumping. Most people need different amounts of basal insulin at different times of the day and a pump allows you to have different basal rates at different times of the day to meet these changing needs. Your Animas® insulin pump can be set to deliver up to 12 basal rates per day.

Once basal rates are set in your pump, the pump will deliver the same amount of insulin at the same time of day, day after day, unless you change the rate(s).

Bolus Insulin

You will need to bolus when you eat carbs and when your BG is higher than your target. There are two main types of bolus doses—carbohydrate boluses and BG boluses (correction boluses).

Carbohydrate Bolus: The type of bolus you take when you eat or drink foods with carbs. The ezCarb feature will help you calculate the amount of insulin needed to cover the carbs eaten.

BG Bolus (Correction Bolus): The type of bolus you take when you need to correct a high BG. The ezBG feature will help you calculate the amount of insulin your body needs to correct a high BG.

(See the sections, Basal Rate Details and Bolus Dose Details, on pages 7 - 12 for more information on these topics.)

Day-To-Day Life with an Insulin Pump

Your schedule on a pump may be different than it was on injections. After the initial period of getting used to your pump and adjusting your doses (which may take several weeks to months), most people prefer being on a pump to taking injections. Pumping helps put you in control of your diabetes and gives you greater flexibility in your life.

The comparison on the next page shows the typical routines of people with type 1 and type 2 diabetes who are on injection therapy versus people on pumps.

Typical routines on injections:*

Type 1 diabetes

- 2-5 insulin injections/day
- Scheduled meals/snacks
- Planned exercise
- Checking BG 2-6 times each day

Type 2 diabetes

- 1-4 insulin injections/day, oral medication
- Scheduled meals/snacks
- Planned exercise
- Checking BG 1-4 times each day

Typical routine on a pump:

Pump therapy routine

- Inserting the infusion set every 2-3 days
- Meals and snacks (when and if you want to eat) with precise insulin dosing
- Spontaneous exercise/activity
- Checking BG 4-8 times each day

Since a pump does not automatically deliver the bolus doses you need (you need to program them), it is important that you consider the points listed below.



All new pumpers should:

- Check BG at least 4-8 times every day
- Learn and use carbohydrate counting
- Keep detailed records including food, BG and exercise
- Learn how to adjust insulin doses for high and low BG, carb intake, exercise, sick days, etc.
- Communicate regularly with your HCP

It is important to check your BG at least 4 times a day. This is necessary to keep yourself safe on a pump. (See more information in the chapter, Troubleshooting High Blood Glucose on page 30.) When new to pumping, you may be asked by your HCP to check your BG 8 to 10 times per day to help you get on track quickly.



Test your knowledge:

1. Insulin pumps usually deliver only rapid-acting insulin. True / False
2. The small continuous delivery from an insulin pump is called Basal / Bolus
3. Rapid-acting insulin works for up to ____ hours after it is injected.
4. The insulin I take to cover my food or to correct a high BG is called Basal / Bolus
5. As a pump user, I should check my BG a minimum of ____ times per day.

Answers to "Test Your Knowledge" can be found in the back of this workbook.

*Or as directed by your HCP.

Basal rate details.

Your insulin pump automatically releases small amounts of insulin every few minutes. This is called a basal rate. Based on your blood glucose trends, the basal rate is adjusted to keep the BG level steady between meals and during sleep. The basal rate can also be adjusted to help maintain normal BG readings when hormone levels fluctuate. Basal insulin is often referred to as “background insulin.”

Even though the pump delivers basal insulin every few minutes, the basal rate is set as an hourly rate—in other words, the total amount you get over one hour. When you first start on the pump, you may only have one basal rate throughout the day. You can change this hourly rate multiple times per day to meet your changing basal needs. For example, your body may need more insulin in the early morning to compensate for Dawn Phenomenon. (Dawn Phenomenon is a condition which causes a sudden rise in BG levels in early morning hours due to hormones.)

Once your basal rate(s) is programmed into the pump and the program is active, it will repeat the same pattern day after day without any further input from you, unless you change it. (See Fine Tuning Basal Rates on page 46.)

Basal Programs

Your Animas® pump has multiple basal programs to help you meet your insulin needs for different situations. For example, your activity level during the week may be very different than on weekends. This difference may change your daily basal insulin needs. Using multiple basal programs allows you to set a basal program for “weekdays” and another program for “weekends.”

Setting multiple basal programs is an advanced feature and will be covered in greater detail in the section on Advanced Pumping, page 57. For now, we want you to understand what it means when you see the programs in your pump and to know this feature is available to you in the future.

Temporary Basal Rate

Your Animas® pump allows you to temporarily override your active basal program by using the Temporary Basal Rate feature. This is useful when you need to increase or decrease your active basal delivery for short-term situations such as sick days or exercise.



Using multiple Basal Programs and Temporary Basal Rates are advanced pumping topics which are covered in more detail in the section on Advanced Features (page 57).

Basal Rates Summarized:

- A Basal Program is a 24 hour set of basal rates.
- You can choose from one to twelve different rates starting at different times of the day to accommodate your changing insulin needs. (These different rates are called segments in the pump.)
- You can customize 4 different basal programs.
- Only one Basal Program can be active (or running) at a time.
- A Temporary Basal Rate will override the active Basal Program for a chosen amount of time.

What is My Basal Rate?

Your HCP will determine your starting basal rate(s). Several factors will be considered, including your current insulin regimen, weight and BG levels. Your starting basal rate(s) is an estimate that will most likely need to be fine-tuned once you start pumping.



Test your knowledge:

1. Basal insulin is the continuous amount of insulin my body needs throughout the day, even when I don't eat. True / False
2. Listed are two situations when I might want to use the temporary basal rate feature:

Bolus dose details.

You need to give a bolus dose of insulin when you eat or to correct a high BG. In general, there are two types of boluses: Carb Boluses and BG Boluses (correction boluses). We briefly discussed this in Pump Therapy Overview. Review the section below for a summary of what you should consider before you bolus.

Your Animas® pump has a feature which will calculate a suggested bolus. Bolus doses are based on the following:

- The grams of carbohydrate you plan to eat
- Your insulin-to-carbohydrate ratio (I:C)
- Your BG level
- Your insulin sensitivity factor (ISF)
- The timing of your last bolus, or “insulin on board” (IOB)
- Recent or planned activity

Carbohydrate Bolus

To calculate the amount of insulin for when you eat, you will need to know your Insulin-to-Carb Ratio. This is typically written as I:C, and tells you how many grams of carbohydrate 1 unit of insulin will cover. For example, if your I:C is 1:15, you need to bolus 1 unit for every 15 grams of carbohydrate you plan to eat.

Here is the formula to calculate a carbohydrate bolus:

$$\text{Carbohydrate grams} \div \text{My I:C} = \# \text{ of units to bolus}$$

Sample Carbohydrate Bolus Calculation:

If your I:C is 1:10 and you are planning to eat 45 grams of carbohydrate for lunch, how much would you bolus?

$$45 \text{ grams of carbs} \div 10 \text{ (I:C)} = 4.50 \text{ units of bolus insulin}$$

Of course, the accuracy of your carbohydrate bolus is only as good as your carbohydrate estimate! (See section Counting Carbohydrates, page 14 for help with this.)

BG Bolus

The purpose of the I:C is to prevent your BG from rising too high after a meal. But what if your BG was out of your target range even before the meal? This is where calculating a BG bolus (correction bolus) comes in. To calculate the amount of insulin to correct a high BG, you need to know your Insulin Sensitivity Factor (ISF). This is a number that estimates how much 1 unit of insulin will lower your blood glucose. For example, if your ISF=50 mg/dL, then you should

expect a bolus of one unit to lower your BG about 50 mg/dL

Before we look more closely at the calculation, it is important to discuss BG targets.

A Word or Two about BG Targets

A typical BG target before meals is 100 mg/dL. However, when you are new to pumping, or if you have difficulty recognizing a low BG (hypoglycemia unawareness) until you are quite low, or not at all, you may be advised to aim for a higher target such as 120 or 140 mg/dL. Also, if your glucose control before starting pump therapy is in a higher range, your HCP may advise higher targets with the goal of gradually improving your glucose control.

It is common to have a target BG range, not just a single number. For example, if your target range is 80 –120 mg/dL, you do not have to give BG bolus unless your BG is higher than 120 mg/dL. To keep the math simple, find the number in the middle of your target BG range and use this in your bolus dose calculations. So, if your target range is 80 –120 mg/dL, you would use 100 mg/dL as the Target BG in your correction formula.

Target BG values after meals are higher than before meals. Remember, your bolus from a meal may still be working for up to 5 hours after you eat. A typical target BG for two hours after eating is 160 – 180 mg/dL.

Some HCPs may also suggest that you use a different target at different times of the day. For example, your bedtime target may be a bit higher than during the day to guard against low BG while you are sleeping. In addition, it is common to have a different (higher) target for certain situations like driving, operating heavy machinery or climbing ladders.

It is important to know that BG targets will be different during pregnancy and for children.

Check with your HCP for your individual target goals!

Calculating a BG Bolus

Here is the formula to calculate a BG bolus:

$$(\text{Current BG} - \text{Target BG}) \div \text{ISF} = \# \text{ units for BG Bolus}$$

Sample BG Bolus Calculation: BG is Above Target:

If your ISF is 50 and your target BG is 100 mg/dL, how much would you bolus if your BG is 250 mg/dL?

$$250 \text{ mg/dL (BG)} - 100 \text{ mg/dL (target BG)} = 150 \text{ mg/dL over target}$$

$$150 \text{ (mg/dL over target)} \div 50 \text{ mg/dL (ISF)} = 3.0 \text{ units of insulin to lower BG } 150 \text{ mg/dL}$$

With both the carb and BG bolus, there are other details to consider before calculating your

bolus. An advanced pumping feature, called IOB, can help you adjust your boluses based on the insulin still working in your body from recent boluses. (See the section IOB on page 59.)



Your HCP will help you determine your initial BG targets, I:C and ISF.



Test your knowledge:

1. I use the ISF to calculate:
 - a. how much insulin to take when I eat.
 - b. how much to bolus to correct a high BG.
2. I use the I:C to calculate:
 - a. how much insulin to take when I eat.
 - b. how much to bolus to correct a high BG.

I:C ratios and ISFs vary from person to person. They may also vary in the individual, depending on the time of day or different circumstances. For example, you might need a different ISF when you give a BG bolus before bedtime. Perhaps your usual ISF of 40 mg/dL works well in the daytime, but at night it always causes a low BG. In this case, using an ISF of 40 mg/dL in the daytime and an ISF of 50 mg/dL at bedtime might be the solution. (See the section on Fine-Tuning Bolus Dose Formulas pages 52 - 56.)

When Your BG is Less than Target

You might also calculate a BG bolus if your BG is lower than target and you are planning to eat. In this case, your BG bolus might be a negative number. This number will tell you by how much to reduce your carb bolus. Basically, you are taking less insulin than you would normally take for the food you are planning to eat. This is often referred to as a negative correction. See the following example.

Sample BG Bolus Calculation; BG is below target:

If your ISF is 50 mg/dL and your target BG is 100 mg/dL, how much is your BG bolus if your BG is 70 mg/dL?

$$70 \text{ mg/dL (BG)} - 100 \text{ mg/dL (target BG)} = -30 \text{ (mg/dL lower than target)}$$

$$-30 \text{ (mg/dL lower than target)} \div 50 \text{ mg/dL (ISF)} = -0.60 \text{ units}$$

In the above example, you would subtract 0.60 units from your carbohydrate bolus to get your bolus total. For example, if your carb bolus was 4.50 units, you would only bolus 3.90 units (4.50 minus 0.60). If you were not planning to eat a meal, you should consume some carb that will act quickly (ie, glucose tablets) to treat the low BG. (See the section Low Blood Glucose, "The Rule of 15" on page 34 for more information.)

Sometimes, it may be easier to treat the low BG with carbs as you normally would, rather than

calculating a negative correction. In other words, eat or drink 15 grams of fast-acting carb right away! In this case you would then just take your usual carb bolus for the meal. Do not add the carbs you used to treat the low BG.

Putting It All Together

After reviewing this information, you may need to use just one of these bolus formulas, or you may need to use both. Consider the following situations and then enter the data into the appropriate formulas.

- You are eating a meal and your BG is in your target range, just use the I:C.
- It is several hours after a meal and your BG is high. If you are not planning to eat, just use the ISF
- Consider when you last bolused. Is that bolus still working? (See IOB on page 59.)
- You are about to eat and your BG is outside your target range. Use both the I:C and ISF and add (or subtract) the results.

Bolus Calculation Review: Steps to Calculate a Bolus

1. If you are about to eat a meal or snack, determine how much carb you will be eating and use your I:C to calculate a bolus.
2. Calculate a correction dose using your ISF if your BG is outside your target range. Make sure you consider the timing of your last bolus dose and adjust this amount accordingly.
3. Add the results of the two calculations together, if needed, and bolus this total amount. If your BG is lower than target, subtract the BG bolus from the food bolus to determine the total amount to take.



Test your knowledge:

It is lunchtime and I need to calculate my bolus dose. Use the following facts to figure out the dose for the three examples below:

Carbs consumed: 56 grams

I:C is 1:12, ISF is 60 mg/dL

Target range is between 80 mg/dL and 120 mg/dL and your Target BG is 100 mg/dL.

BG = 115 mg/dL Bolus = _____

BG = 202 mg/dL Bolus = _____

BG = 70 mg/dL Bolus = _____



Always check with your HCP for specific recommendations when calculating your ISF between meals or making "negative" corrections.

Now let's practice.

Fill in the table below with your I:C ratio, ISF, and your BG target. Using the example below, fill out three meals/snacks and calculate the appropriate bolus dose using your I:C, ISF and target BG.

My I:C	My ISF	My Target BG

(Sample I:C 1:15; ISF 50; Target BG 120 mg/dL; Actual BG 250 mg/dL)

Time	Qty	Food/Drink	Carb grams	Time	Qty	Food/Drink	Carb grams
	3 oz	Chicken	0				
	1 cup	Mashed potatoes	34				
	8	Asparagus spears	5				
	1	Small roll (1 oz)	15				
	2 tsp	Margarine	0				
	1	Small pear (5 oz)	21				
Total Carb			75g	Total Carb			
Bolus Calculation				Bolus Calculation			
Carb bolus (75 ÷ 15)			5.0 u	Carb bolus (÷)			
Correction bolus (250 - 120) ÷ 50			+2.6 u	Correction bolus (-) ÷			+
TOTAL BOLUS			7.6 u	TOTAL BOLUS			

Time	Qty	Food/Drink	Carb grams	Time	Qty	Food/Drink	Carb grams
Total Carb				Total Carb			
Bolus Calculation				Bolus Calculation			
Carb bolus (÷)				Carb bolus (÷)			
Correction bolus (-) ÷			+	Correction bolus (-) ÷			+
TOTAL BOLUS				TOTAL BOLUS			

What is My I:C Ratio and ISF?

Your HCP will help you determine your starting I:C ratio, ISF, and Target BG. Your starting bolus dose formulas are estimates that may need to be adjusted or fine-tuned once you start pumping.

Counting Carbs: The Basics

Food provides us with three major nutrients from which we get calories: protein, fat, and carbohydrate. We also get vitamins and minerals from food, but these micronutrients do not supply calories.

Carbohydrate is the nutrient that raises BG the most and the fastest. In fact, almost all of the carbs we eat, no matter what type of carb, will end up as glucose in our bloodstream within approximately 1 to 1 ½ hours. Many foods such as breads, cereals, rice, pasta, fruits, milk, yogurt, starchy vegetables, and sweets (cakes, pies, candies, cookies, soda, etc.) contain carb.

Some carbs such as those found in juice or regular soda can enter your blood stream very quickly, while others that are higher in fiber, such as those found in wheat bread, or baked beans tend to enter the blood stream more slowly.

Once the carb from your meal has been converted to glucose and absorbed into your blood stream, insulin is required in order for that glucose to be transported back out of your blood stream and into your body's cells where it can be burned for energy.

People who have type 2 diabetes may be able to produce adequate insulin on their own, especially with the help of certain medications. However, people with type 1 diabetes will need supplemental insulin either by injection or insulin pump, because their body is unable to produce adequate insulin.

Many factors affect BG levels. A major component involves balancing your carbohydrate intake with insulin, either produced by your body or injected, and is the key to ensuring that your after-meal glucose levels stay within the target range established by your HCP.



If there is not enough insulin present to handle the carb consumed at a meal, then your BG will likely be too high after the meal. However, if there is too much insulin present, then your BG is likely to go too low after the meal.

Monitoring or "counting" how many grams of carb are consumed at a meal or snack is a powerful strategy that you can use to help strike the right balance between insulin and the carb that you eat. Keep in mind, you do not need to avoid carb containing foods, you simply need to balance them with your medication and activity level.

Carb Counting Methods

There are two common methods for counting carbohydrates:

1. Exchange lists/carb choices
2. Carbohydrate gram counting

You may already be familiar with the Exchange Lists for Meal Planning, available from the American Diabetes Association. Carb exchanges, or carb choices, as they are sometimes called, provide lists of foods, that when eaten in the specified serving sizes, provide about 15 grams of carb. The following table provides examples of a few carb exchanges.

Food or beverage item	Serving size that will provide about 15 grams of carbs
Grains, Beans, Starchy Vegetables	
Bread	1 slice
English Muffin	½
Cereal (dry) ready to eat	¾ cup
Saltine-type crackers	6
Pasta	⅓ cup cooked
Rice	⅓ cup cooked
Beans, Lentils, Peas, Corn	½ cup cooked
Potato	1 small (3 oz)
Fruit	
Apple	1 small (4 oz)
Strawberries, fresh/whole	1¼ cups
Fruit Juice	½ cup (4 oz)
Milk and Yogurt	
Milk	1 cup (8 oz)
Yogurt, Plain	⅔ cup (6 oz)
Desserts/Sweets	
Ice Cream	½ cup
Jam or Jelly	1 Tbsp
Cake or Brownie	2 inch square
Cookies	2 small

Complete Exchange Lists are available from the American Diabetes Association and the American Dietetic Association.

The Exchange Lists are based on averages. For example, $\frac{3}{4}$ cup of dry cereal is considered to be a carb exchange or choice, which means that this amount of cereal contains on average about 15 grams of carb. In reality, if you compare nutrition facts panel on several different cereal boxes, you will notice that the actual amount of carb can range from 10 grams to 28 grams for a $\frac{3}{4}$ cup serving. That is why it is more accurate to use the second method of carb counting—which is to count the actual grams of carb in the food item you are eating.

Carb Gram Counting

It's easy to get the exact carb content of your favorite foods. You might consider purchasing a nutrition content book from your favorite book store, or you could use a searchable food composition database such as the one available at the CalorieKing® website. You may also find many of your favorite restaurants will have the nutrition facts on location or listed on their website. Food labels are especially useful and are widely available on the packaging of most of the foods you purchase at your grocery store. Your Animas® insulin pump or meter-remote comes with a CalorieKing® food database to help overcome carb counting challenges and assist with accurate bolusing for tighter control.

Using Food Labels to Count Carb

Follow these steps to count carbs using a food label:

1. Locate the serving size near the top. Note: In this section of the food label, "g" (grams) is the weight of the food in grams, not the carb grams in the serving.
2. Look for grams of Total Carb in each serving.
3. Measure or weigh what you will be eating and compare it to a serving size. Adjust the carb grams to reflect the amount of the food item that you actually eat.
4. If there are more than 5 grams of fiber listed, then half of the fiber grams should be subtracted from the total carb amount.
5. If there are more than 5 grams of sugar alcohols listed, then half of the sugar alcohol grams should be subtracted from the total carb amount

Nutrition Facts			
Serving Size 1/2 cup (114g)			
Amount Per Serving		As Served	
Calories 90	Calories from Fat 30		
		% Daily Value	
Total Fat 3g			5%
Saturated Fat 0g			0%
Cholesterol 0g			0%
Sodium 300mg			13%
Total Carbohydrate 13g			4%
Dietary Fiber 3g			12%
Sugars 3g			
Protein 3g			
Vitamin A 80%	✕	Vitamin C 60%	
Calcium 4%	✕	Iron 4%	
Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:			
		Calories	2,000 2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	80g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Carb Counting Tools

It is important to remember that carb counting is only accurate when you pay attention to serving sizes. Measuring utensils and a food scale are very useful to help you with developing an eye for accurate serving sizes. Keep in mind that stated serving sizes are simply a reference point. Just because a serving size says 1/3 cup (such as the carb exchange for cooked rice) it does not mean that is all you should eat. It is there to tell you that the nutritional information

provided is for the 1/3 cup portion. If you choose to eat a full cup of cooked rice (a more realistic amount for many people), you need to know that this is actually 3 servings and will provide 45 grams of carb, not 15 grams.

Counting carbs can be simple if you use all of the available tools and practice! On the other hand, if this is all new to you, it may seem “easier said than done.” Be patient and remember that it will get easier with time, practice, and experience. Many of us eat the same foods over and over so you will have the carb content of your favorite foods memorized in no time. The following carb counting tools can help you to develop your carb counting skills:

Carb Counting Tools

- Nutrition Labels
- Measuring cups and spoons
- Food scale
- Exchange Lists for Meal Planning (American Diabetes Association)
- Nutrition content books
- CalorieKing®
- ezManager® software from Animas Corporation
- Animas® insulin pump systems with food database

Sometimes it is not convenient to measure your food. Comparing your serving sizes to the size of familiar items can be helpful. Here are a few examples:

Estimating Portion Sizes

- Tennis Ball = 1 cup cooked rice; 1 medium piece of fruit
- 1 compact disk (CD) case = 1 slice of bread
- Baseball = 1 cup of fruit or 1 cup ice cream
- Most women’s fist = 1 cup cooked rice, pasta, or vegetables
- Most men’s fist = 1½ cups cooked rice, pasta or vegetables
- 1 light bulb = ½ cup fruit or vegetable

How Much Carb Should You Eat?

As you have learned, carbs have the greatest impact on your BG following meals. The ideal amount of carb per meal that people with diabetes should eat is highly individualized. Your personal meal plan should take into account your activity level, your medications, other health conditions such as high cholesterol or high blood pressure, your age, your weight, and of course your personal food preferences.

A registered dietitian can help you to design a personalized meal plan that is ideal for you.

I:C ratios

By using an I:C ratio to calculate your insulin dose, you simply take more insulin for higher carb meals, and less insulin for lower carb meals. I:C ratios define how many grams of carb one unit of insulin will cover. For example, an I:C ratio of 1 unit:10 grams means that 1 unit of insulin is required for every 10 grams of carb eaten. An I:C ratio of 1 unit:15 grams means that 1 unit of insulin is required for every 15 grams of carbs eaten.

Here are a few examples of how easy it is to use an I:C ratio to calculate a pre-meal insulin dose:

Example 1		
Footlong submarine sandwich	I:C ratio	Insulin dose
Carbs = 80 grams	1 unit per 10 grams of carbs	8 units
Example 2		
Bowl of breakfast cereal with fruit	I:C ratio	Insulin dose
Carbs = 60 grams	1 unit per 15 grams of carbs	4 units

The flexibility to eat more when you are very hungry and eat less when you are not so hungry is a wonderful benefit of using I:C ratios for calculating a meal-time insulin dose. However, if you are concerned about your weight, or are actively trying to lose weight, keep in mind it may be a good idea for you to limit your carbs to no more than 60 grams, at each meal, to help with calorie control.

Fiber and Sugar Alcohols

Fiber is a type of carb which is not digested. As a general rule, when a serving of food has more than 5 grams of fiber, subtract half of the listed fiber grams from the total carb amount.

Sugar alcohols include isomalt, sorbitol, xylitol, mannitol, lactitol, maltitol, and erythritol. They have fewer calories and a smaller impact on BG levels as compared to other carbs. Sugar alcohols are fine in reasonable quantities. Too much at one time may cause uncomfortable symptoms such as gas and bloating.

As a general rule, if a food contains more than 5 grams of sugar alcohols, subtract half of these grams from the total amount of carb that is listed. On a food label, sugar alcohols are usually listed underneath the "Total Carb" line.

Protein and Fat

Protein and fat can affect BG levels as well. In general, foods with large amounts of protein, and especially those that contain high amounts of fat, tend to slow digestion so that the carbs in the meal enter your bloodstream more slowly. Also, large amounts of fat in a meal can cause your

body to use insulin less efficiently. Your Animas® insulin pump allows you to bolus in different ways to help you match the slower digestion of meals that are higher in protein and fat. (See the section on Advanced Pumping features on pages 57 - 62 for more information on extended and combination boluses.)

Alcohol

Alcohol by itself does not contain carbs. Beer and many drinks that contain alcohol also have carbs. In general, alcohol can lower BG and therefore you should always consume alcohol with a meal or snack. The American Diabetes Association recommends no more than two drinks per day for men, and no more than one drink per day for women. Talk with your HCP for their recommendations on drinking alcohol.

Glycemic Index

The glycemic index ranks carb-containing foods based on how they affect BG levels two to three hours after you eat. Foods that raise after-meal glucose levels more than other foods, even if the carb amounts are the same, have a higher glycemic index. There are many factors involved in the glycemic index and these factors can affect individuals differently. Some carbs are digested slower than others. To keep carb counting practical and simple, you still count all carbs the same way. By keeping detailed records of foods eaten, insulin doses taken, and your resulting BG levels, you can learn which foods have a bigger impact on your BG. You may learn that there are some carbs that require extra insulin. Don't forget that advanced bolus features on most pumps can help you successfully include these types of foods in your meal plan.

Summary

Counting the actual amount of carb in your meals and snacks is a great method to help you determine the ideal amount of insulin that you will need to give. By keeping detailed records and working closely with your HCP, you will find you can work in your favorite foods and meals while maintaining your BG control.

Carbohydrate Content of Common Foods

The following tables are intended to provide a quick reference for the carb content of several common foods.

Food Item	Portion	Carb (grams)
Breads		
Bagel, plain, onion	1 med (3 oz)	45
Blueberry muffin	1 med (4 oz)	54
Biscuit, buttermilk	1 biscuit (2.1 oz)	21
Bread, wheat, sandwich	1 slice	12
Bread, white, sandwich	1 slice	12
Bread, low calorie ("lite")	1 slice	8
Bread, low carb	1 slice	9
Dinner roll	1 med (1.5 oz)	23
English muffin, plain	1 small (2 oz)	26
French toast	1 slice (1.5 oz)	2
Hamburger bun	1 bun (1.5 oz)	22
Hotdog bun	1 bun (1.25 oz)	21
Pancake, buttermilk 4" diameter	1 pancake	11
Pita bread, 4" diameter	1 pita	18
Taco shell, corn	1 shell	8
Tortilla, corn, 6" diameter (Mission Foods)	1 tortilla	14
Tortilla, flour, 6" diameter (Mission Foods)	1 tortilla	25
Waffle, 7" diameter	1 waffle	25
Cereals		
All Bran, buds	1/3 cup	24
Bran Flakes	3/4 cup	23
Cheerios	1 cup	24
Corn Flakes	1 cup	24
Cream of Wheat, instant	3/4 cup	24
Frosted Flakes	3/4 cup	27
Frosted Mini Wheats (bite size)	24 minis	48
Granola, low-fat	1/2 cup	40
Grits	1/4 cup	31
Oatmeal, instant	1 packet	19
Product 19 (Kellogg's)	1 cup	25
Rice Krispies (Kellogg's)	1 1/4 cup	29
Raisin Bran (Kellogg's)	1 cup	45
Special K (Kellogg's)	1 cup	23
Wheaties (General Mills)	3/4 cup	22

Food Item	Portion	Carb (grams)
Grains & Pasta		
Couscous, cooked	1 cup	37
Pasta, cooked	1 cup	44
Rice , cooked, brown	1 cup	46
Rice, cooked, white	1 cup	44
Crackers		
Animal crackers	6 crackers (1 oz)	22
Cheese Nips	1 oz	19
Croutons	2 Tbsp	4
Graham crackers	8 squares	22
Oyster crackers	½ oz (51 crackers)	10
Ritz Crackers, original	½ oz (5 crackers)	10
Saltines, original	5 crackers	11
Wheat Thins	11 crackers	21
Fruit Juice		
Apple Juice	8 oz (1 cup)	29
Grape Juice	8 oz (1 cup)	38
Grapefruit Juice	8 oz (1 cup)	22
Orange Juice	8 oz (1 cup)	26
Pineapple Juice	8 oz (1 cup)	32
Prune Juice	8 oz (1 cup)	45
Tomato Juice	8 oz (1 cup)	10
Vegetable Juice	8 oz (1 cup)	11
Fruits		
Apple, small	1 (4oz) apple	13
Applesauce, sweetened	1 cup	51
Applesauce, unsweetened	1 cup	28
Apricot, sliced	1 cup	19
Banana, small (6")	1 banana	23
Cantaloupe, diced	1 cup	13
Cherries	1 cup	19
Fruit cocktail, canned in juice	½ cup	14
Grapefruit	½ grapefruit	13
Grapes	1 cup	28
Honeydew melon, diced	1 cup	14
Kiwi, medium	1 kiwi	11
Mango, sliced	½ cup	14

Food Item	Portion	Carbohydrate(grams)
Fruits (cont.)		
Nectarine, medium	1 nectarine	12
Orange, medium (3" diameter)	1 orange	21
Papaya, diced	½ cup	7
Peach, medium	1 peach	11
Pear, small	1 pear	18
Pineapple, diced	1 cup	19
Plum, small (2" diameter)	1 plum	7
Raisins	1 oz	23
Strawberries	1 cup	12
Watermelon, diced	1 cup	11
Starchy Vegetables		
Beans, baked, (all brands, average)	½ cup	25
Beans, black	½ cup	20
Beans, kidney	½ cup	19
Beans, pinto	½ cup	19
Corn, kernel	½ cup	18
Corn on the cob, large ear	1 ear	28
Peas, green	½ cup	21
Potato, baked, large (7 oz)	1 potato	42
Potato, mashed	½ cup	18
Squash, acorn, cooked	½ cup	9
Sweet potato, medium (4 oz)	1 sweet potato	24
Non-Starchy Vegetables		
Beans, green, snap	½ cup	4
Beans, wax	½ cup	4
Brussels sprouts	½ cup	6
Cabbage, shredded	½ cup	2
Carrots, sliced	½ cup	6
Celery, sliced	½ cup	1.5
Cucumbers, sliced	½ cup	2
Eggplant, sliced	½ cup	2
Lettuce, shredded	½ cup	0.5
Mushrooms	½ cup	1
Onions, chopped	½ cup	8
Peppers, green bell, chopped	½ cup	5
Spinach, cooked	½ cup	4
Squash, zucchini	½ cup	2
Swiss chard, chopped, cooked	½ cup	3

Food Item	Portion	Carb (grams)
Non-Starchy Vegetables (cont.)		
Tomatoes, raw, chopped	½ cup	3
Dairy Products		
Cheese, Kraft singles	1 slice	0.5
Cottage cheese	½ cup	6
Ice cream, regular (all brands, average)	½ cup	24
Ice cream, low-fat (all brands, average)	½ cup	21
Ice cream, Carb-Smart, Breyers brand	½ cup	13
Milk, whole	1 cup (8 oz)	12
Milk, 2% fat	1 cup (8 oz)	12
Milk, skim	1 cup (8 oz)	13
Milk, chocolate flavored, 1% fat	1 cup (8 oz)	26
Yogurt, fruit flavored, (all brands, average)	8 oz	32
Yogurt, non-fat (all brands, average)	8 oz	43
Yogurt, fat free, no sugar added (all brands, average)	8 oz	15
Meats & Eggs		
Beef, chicken, fish, pork, venison (plain cooked, no breading)	3 oz	0
Egg, cooked, plain	1 egg	0
Nuts		
Almonds	½ cup	13
Cashews	½ cup	20
Peanuts	½ cup	11
Peanut butter	2 Tbsp	7
Pistachios, shelled	½ cup	18
Walnuts	½ cup	6
Fats & Oils		
Butter	2 Tbsp	0
Cooking oils	2 Tbsp	0
Margarine	2 Tbsp	0
Mayonnaise, regular	2 Tbsp	0
Salad Dressing, all brands, average	2 Tbsp	2
Desserts, Sweets & Snacks		
Angel Food cake (1/12th of a 10" cake)	1 piece	29
Brownie (all brands, average)	2" square	12
Cake, frosted (1/8th of a 10" cake)	1 piece	35
Chocolate bar (1.5 oz)	1 bar	26
Cookie (1.2 oz)	1 cookie	22
Donut (cake-type) (all brands, average) 3" diameter	1 donut	24
Pie, apple (1/8th of a 9" pie)	1 slice	58

Food Item	Portion	Carb (grams)
Desserts, Sweets & Snacks (cont.)		
Popcorn, popped	1 cup	6
Pudding, ready to eat (all brands, average)	3.5 oz	20
Sherbert, orange	½ cup	28
Soda, regular, avg all brands	12 oz can	39
Syrup, maple, regular (all brands, average)	2 Tbsp	27
Syrup, maple, sugar-free (Cary's)	2 Tbsp	5

Source:

The above carb data was obtained from the publication: CalorieKing® 2010 edition and from the CalorieKing.com website.



Test your knowledge:

1. When I eat carbs, how long does it generally take for the food to have its biggest effect on my BG? _____
2. One carb choice from the *Exchange Lists for Meal Planning* will have ____grams of carb.
3. Exchange Lists provide averages based on specific serving sizes of similar foods.
True / False
4. Fat can delay the digestion process and lead to higher BG levels many hours after eating a meal. True / False
5. The following meal has about _____grams of carbs:
Turkey sandwich, small apple, 1 cup (8 oz.) of skim milk
6. The Animas® insulin pump has advanced bolus features to help you better manage foods which digest more slowly. True / False

Section 2: Starting on insulin

Finally, it is time to start using your insulin pump! It is normal to be a little nervous. This is a big change in the way you will manage your diabetes. If you have any questions from the earlier sections of this workbook, be sure ask your HCP to answer them before you begin pumping.

This section provides important details about starting on your insulin pump.

Topics covered in this section include:

- Infusion Site Selection and Care
- Getting Ready For Your Pump Start Appointment
- Initial Pump Settings
- Troubleshooting High BG and Diabetic Ketoacidosis (DKA)
- Low BG
- Handling Sick Days
- Physical Activity
- Recordkeeping
- Wearing the Pump

Infusion site selection and care

It is important to choose infusion sites that will help your insulin absorb evenly, and to take good care of the sites you choose. Taking care of your sites will help prevent changes in your tissue (like hardening and bumps) and will help prevent infections.

Selecting Sites

Insulin is absorbed and used best from the abdominal area. It is the most common area recommended by HCPs for infusion set placement. Other popular sites are the hip and upper buttocks area (above or below your belt line).

When inserting an infusion set, you should avoid the waistline or belt area and undergarment lines. Placing an infusion set in these areas may cause friction leading to site irritation and the set may become dislodged. Insert the infusion set at least two inches away from the belly button and avoid areas with scars, tattoos and moles for premium absorption of your insulin.

Caring for Sites

Infusion site infections are potential problems for pumpers. By taking proper care, you can greatly minimize your risk. This includes preparing your skin properly before inserting an

infusion set, changing your infusion set as directed by your HCP, and quickly responding to any problems that arise. (See below for an overview and see Appendix 2 for more details.)

Caring for Infusion Sites:

- Always wash your hands thoroughly before changing your infusion set.
- Change your infusion set every two to three days or as directed by your HCP.
- Change your infusion set early in the day. This will allow you to take action more quickly if your insulin is not infusing properly through the cannula (the part that sits under the skin and delivers insulin into the body). If your insulin is not infusing properly, you will notice because your BG levels will be higher than usual.
- Rotate your sites and allow at least one to two inches between site rotations.
- Make sure you are working on a clean surface when you change your infusion set.
- Clean the site you plan to use per instructions from your HCP. Changing an infusion set after bathing helps to ensure the insertion area is clean.
- Prepare your site with a product such as IV Prep® or as recommended by your HCP. (See Appendix 2 for other options.)
- After preparing your site, allow it to dry naturally. Do not blow on or touch the site because this may lead to the spread of germs.
- Inspect the sterile packages before you open them. Do not use a package if it has been damaged.
- Once you open the package, keep the contents inside the package to keep them sterile. Do not place the contents directly on the table.
- Make it a habit to inspect your site twice a day. If you notice signs of infection, report them to your HCP as soon as possible.
- Change your infusion set if you notice discomfort or signs of infection at the site.



Signs of infection include:

redness, warmth, pain, or discomfort at the site, unexplained high BG, swelling, drainage or unpleasant odor.



Test your knowledge:

How often should I change my infusion set? _____

Taking good care of infusion sites can help prevent infections. True / False

What is the most commonly recommended site location? _____

Getting ready for your pump start appointment

Date: _____ Time: _____ Location: _____

1. Please be prepared by reviewing your Orientation DVD, Owner's Booklet, and this workbook and practice with your pump, not attached to your body, by doing some basic programming. You will practice these skills again the day of your pump start appointment.

2. The night before your pump start appointment:

If you are using intermediate or long-acting insulin (NPH/Lantus®/Levemir®) take ____ units of insulin at _____ the night before your pump start appointment or check with your HCP or pump trainer for specific instructions.

3. The morning of your pump start appointment:

Take your short or rapid-acting insulin (Regular/Humalog®/NovoLog®) for your food and any high BG. Check with your HCP for specific instructions on whether or not to take any intermediate or long-acting insulin the day of your pump start.

4. Eat your usual breakfast the morning of your pump start appointment. Remember to cover the carbs with short or rapid-acting insulin that your HCP has prescribed.

5. Bring these items with you the day of your pump start:

- (1) unopened vial of Humalog® or NovoLog® insulin
- Insulin pump in its box, Owner's Booklet, (2) cartridges, (2) infusion sets and (2) IV Preps™
- BG meter, lancets, and test strips
- Alcohol swabs
- BG logs
- Glucose tablets or another treatment for hypoglycemia

6. Other items you need:

- Ketone test strips (for persons with type 1 diabetes or as directed by your HCP)
- Carb counting book
- Glucagon emergency kit

7. Additional Information (to be provided by your HCP):

Pump start doses

Basal Rate

My starting basal rate is _____ units per hour.

Other: _____, _____, _____

Carb Boluses

Use the I:C ratio to calculate a bolus dose before meals and snacks. My I:C ratio is _____.

Bolus 1 unit for every _____ grams of carbohydrate.

Formula for calculating Carb Boluses:

$$\text{Carb grams} \div \text{my I:C ratio} = \# \text{ of units to bolus}$$

Time of day	My I:C ratio
12am	

BG Boluses

Use the Insulin Sensitivity Factor (ISF) to calculate a BG bolus when BG is out of target range.

My ISF is _____.

1 unit of insulin will drop my BG approximately _____ mg/dL.

Time of day	My ISF
12am	

BG Target

My target BG is _____mg/dL with a target range of +/- _____mg/dL.

Time of day	My BG target	My BG target range (+/-)
12am		

Formula for High BG corrections:

$$(\text{Current BG} - \text{Target BG}) \div \text{ISF} = \# \text{ units needed to return BG to target}$$

Additional Notes: _____

Troubleshooting high BG (hyperglycemia)

When pumping, high BG must be taken seriously as insulin pumps deliver only rapid-acting insulin. Without any long-acting insulin in your body, BG can rise quickly if the insulin flow is accidentally interrupted and a condition called diabetic ketoacidosis (DKA) can develop. DKA is a very serious condition which must be treated immediately. Understanding DKA will help you to prevent it. Read below for some basic facts about DKA.

DKA: Basic Facts

- Insulin is needed to move glucose out of the bloodstream and into the body's cells where it is used for energy. Without insulin, your body will begin to burn fat for energy. Ketones are an acidic byproduct of burning fat.
- Ketones (acids) can increase to toxic levels in the blood and urine when you don't have enough insulin. Urine ketones can be checked with a visual test strip purchased at your local pharmacy. Ketones in the blood can be detected more quickly than urine using a specific blood ketone testing system and strips. Ask your HCP when and how to test for ketones.
- DKA results when there is not enough insulin for your body to use glucose for energy.
- High BG combined with ketones is a serious medical problem that must be treated immediately.
- A serious illness or infection can also cause ketones.
- DKA is more common in persons with type 1 diabetes, although it can occur in those with type 2 under certain circumstances.
- If ketone strips detect moderate to large ketones and your BG is elevated, you must assume there is a problem with the insulin delivery from your pump. Usually the problem is related to the infusion set or site. If it is not an infusion set/site issue, it may be a problem such as: an error in programming, loss of delivery, bad insulin, or you may be ill or have another medical problem that needs medical attention.
- You will likely need extra insulin to correct high BG when ketones are present. Contact your HCP immediately for specific instructions.

Symptoms of DKA:

Common signs and symptoms of DKA include feeling unusually tired, stomach/abdominal pain, nausea/vomiting, dry mouth, thirst, fruity odor to breath, rapid or difficulty breathing. DKA can lead to dehydration, electrolyte imbalance, diabetic coma, or even death.

Prevention of DKA:

DKA is serious and scary, but it can be prevented! Check your BG regularly (at least 4 times each day) and follow the tips below to be prepared.

- Always carry a syringe and vial of insulin as part of your back up plan.
- Follow the “Action Plan for High BG” on page 32 for high BG.
- Read through the questions below and on the next page to help you troubleshoot your infusion set/site and pump.
- If the high BG is still not explained, check for ketones and follow the Action Plan for High BG on page 32.
- Call your HCP immediately if your BG remains high and you have ketones or nausea after 2 correction doses.
- If you have ketones and begin vomiting, go to the nearest emergency room.

High BG? Questions to Help You Troubleshoot:

CAUTION! If you have moderate to large ketones, first take an injection of rapid-acting insulin, change your infusion set and cartridge and troubleshoot the situation.

The Infusion Set

- Is the tubing primed or filled with insulin?
- Is there air in the tubing?
- Did you remember to fill the cannula with insulin after inserting new set?
- Is the tubing connected to cartridge?
- Is the set connected to your body?
- Are there any leaks?
- Is the cannula dislodged or kinked?
- Has the infusion set been in longer than 2-3 days?
- Is there redness at the site?
- Is there discomfort at the site?
- Is there blood on/at the sit

The Insulin Pump

- Did you forget your last bolus? (review bolus history)
- Have you received any recent alarms?
- Is your cartridge empty?
- Are the date and time on your pump screen correct?
- Are your basal rates programmed correctly?

The Insulin

- Is your insulin expired?
- Is it cloudy or clumped?
- How long has your insulin been at room temperature?
- Did you leave your insulin in a warm location or exposed to sunlight?
- How long has the insulin been in the cartridge and tubing?
- Was your insulin exposed to freezing temperatures?

Action Plan for High BG

- If your BG is higher than 250 mg/dL twice in a row, troubleshoot your pump, infusion set, and site.
- If you find a logical cause for the high BG, take your normal corrective action. Examples of a logical cause include: forgotten recent carb bolus or your infusion set came out. Your action plan for forgetting a carb bolus will include giving a BG bolus through your pump. Your action plan for a dislodged infusion set will include taking a BG bolus by syringe and changing your infusion set.
- If you cannot find a logical cause for the high BG, check for ketones.

Negative to Small Ketones		Moderate to Large Ketones	
<input type="checkbox"/> Give a BG bolus through your pump. <input type="checkbox"/> Drink at least 8 ounces of calorie-free fluids (or amount recommended by HCP) every hour until ketones are gone. <input type="checkbox"/> Recheck BG in 1-2 hours.		<input type="checkbox"/> Call your HCP. <input type="checkbox"/> Take your BG bolus by syringe immediately. You will likely need more insulin than usual for your correction. <input type="checkbox"/> Change your infusion set, cartridge, and tubing. <input type="checkbox"/> Drink at least 8 ounces of calorie-free fluids (or amount recommended by HCP) every hour until ketones are gone. <input type="checkbox"/> Recheck BG and ketones in 1-2 hours.	
<p>If BG is decreasing, that is a good sign, but monitor your BG and ketones more closely throughout the day.</p>	<p>If BG is NOT decreasing, check ketones and take another BG bolus by syringe. Change your infusion set, cartridge and tubing. Continue to monitor to be sure your BG decreases and ketones do not increase to moderate/large.</p>	<p>If BG is decreasing, continue to monitor to be sure your new infusion set is working and ketones resolve.</p>	<p>If BG is NOT decreasing:</p> <ul style="list-style-type: none"> • If ketones are still moderate to large call your HCP. • If ketones are decreasing, take another BG bolus as directed by your HCP and continue to monitor closely.



For two unexplained BG levels over 250 mg/dL ALWAYS:

- Check for ketones.
- Take your BG bolus by syringe.
- Change your infusion set.



Test your knowledge

1. Why is an insulin pump wearer at a higher risk of developing DKA? _____

2. If I have moderate to large ketones, should my correction bolus be given by insulin pump or syringe? _____

3. List four steps I should take immediately if I have moderate to large ketones. _____

Low BG (hypoglycemia)

As you may know, many factors can cause low BG whether you are on a pump or injections.

The good news is that most people on pumps report less frequent and less severe low BG. It is still important to always be prepared for low BG. Also, keep in mind that over time, your symptoms of low BG may change.

If your BG was consistently high before starting on a pump, you may experience some hypoglycemia symptoms as you work to improve your overall glucose control. For example, a BG of 100 mg/dL may feel much lower if you have been used to BG levels in the 300 mg/dL range. Also, the risk for hypoglycemia increases with improved BG control. However, studies support that the benefits of improved glucose control outweigh the risks of hypoglycemia.

In general, the main events that cause hypoglycemia are:

- Too little food
- Too much insulin
- Increase in activity and/or “lag effect” from exercise*
- Drinking alcohol

Treating Low BG

No matter what the cause, it is critical to treat a low BG immediately! The standard treatment is often called the “Rule of 15.” (See the following information on the Rule of 15.) It is best to eat a food that is all carb since this will quickly raise your BG. Foods like chocolate will not work as fast because of the fat they contain.

Recommended treatments include (each suggestion is **15 grams** of carb):

- Glucose tablets, 3-4 tablets (carb content depends on brand)
- Regular soda, 4 ounces or ½ cup
- Fruit juice, 4 ounces or ½ cup
- Honey or table sugar, 1 tablespoon
- Lifesavers®, 5 regular size



“The Rule of 15”

- Eat or drink 15 grams of carbohydrate.
- Wait 15 minutes.
- Recheck your BG.
- If your BG is less than 70 mg/dL, repeat above steps.

* Exercise can exert its BG lowering effect for 12-36 hours after you finish exercising.

Preventing Low BG

When you have a low BG, a little detective work to uncover why your BG dropped below your target range can help prevent future lows. Questions a pump wearer should ask include:

- Is my basal rate too high? (especially if you are having frequent low BGs before meals or during sleeping hours)
- Are my basal rates programmed correctly?
- Is the time on my pump set correctly? Verify that AM / PM are set correctly.
- Do I need an adjustment to my bolus ratios (I:C or ISF)?
- Are my BG targets too low?
- Am I counting my carbs correctly?
- Am I calculating my bolus doses correctly?
- Am I taking carb boluses too soon before meals or snacks? Are my bolus doses overlapping?

Talk to your HCP if you need help answering these questions or determining a cause for your low BG. You can contact Animas Customer Support at 1-877-YES-PUMP (1-877-937-7867) if you would like to confirm the programming of your pump.

Don't get frustrated if you cannot figure out the cause of an occasional episode of low BG. Accept that it is the nature of diabetes. You will experience both high and low BG and not every episode can be explained!

Glucagon Emergency Kits

Glucagon is a hormone that works the opposite of insulin; it raises glucose levels in the bloodstream. Everyone who takes insulin should have a glucagon kit (a prescription item). The kit contains a syringe with liquid and a vial of glucagon powder. The two must be mixed together immediately before using, withdrawn from the vial, and then injected into the thigh, arm, or buttocks. Glucagon is given by a trained family member, friend, or HCP if you are unconscious or having a seizure and unable to safely swallow food or liquid. Talk to your HCP about getting a glucagon kit if you do not have one already. Family members or friends should know where you keep your glucagon and be trained in how and when to use it. Make sure you check the expiration date and replace your kit if it expires, or if used. Also, some people store a glucagon kit in more than one place, including home, school, and work.



Test your knowledge:

1. Listed are two good examples of foods/drinks to treat low BG. _____

2. When my BG is low, I should eat/drink ____grams of carb, then wait ____minutes and recheck my glucose.
3. I should try to determine what caused the low BG once I am feeling better. True / False
4. When I don't feel like eating, I can inject myself with glucagon to treat my low BG. True / False

Handling sick days

It may be more difficult to maintain good BG control during times of illness, surgery, and major stress. Follow the general guidelines below to manage your BG during these times. If you have specific guidelines from your HCP, follow those instead.

Insulin

- Never skip your insulin! Even if you are unable to eat, your need for insulin continues and may even increase due to the illness.
- Continue your basal insulin, carb boluses to cover food eaten using your I:C Ratio(s), and correction boluses to correct high BG using your Insulin Sensitivity Factor(s) as advised by your HCP.
- You may need to temporarily increase or decrease your basal rate(s). Check with your HCP for instructions. (See page 62 for information on the Temporary Basal Rate feature on your Animas® pump.)

Blood Glucose/Ketone Checks

- Check your BG as usual before meals and snacks. Check more frequently (every 2 to 4 hours) during illness.
- Check your urine or blood for ketones if your BG is greater than 250 mg/dL or as directed by your HCP.
- Ketone testing will guide you in determining BG bolus doses and the method of delivery (pump versus syringe). (See the Action Plan for high BG on page 32.)

Fluids/Nutrition

- Consume 150-200 grams of carb daily. (See list entitled Foods that contain 15 grams of Carb on page 38.)
- Consuming adequate fluids is important during illness to prevent dehydration.
 - Try to drink 8 oz of fluids every hour and drink fluids slowly.
 - Approximately half of these liquids should contain carb (not “diet” or “sugar-free”) or sugar. The amount may be better tolerated if given in smaller amounts every 20-30 minutes.
 - If experiencing vomiting and/or diarrhea, every third hour, consume a sodium-rich choice such as broth if there are no underlying health issues (eg, congestive heart failure or high blood pressure).
- Check with your HCP for additional instructions.

When to Call Your HCP*

- Illness continues without improvement for more than 24 to 48 hours.
- Temperature/fever greater than 100°F.
- Vomiting or diarrhea continues longer than 4 hours.
- Moderate to large ketones in the blood or urine.
- Your BG levels are less than 70 mg/dL or above 250 mg/dL and not responding to usual corrective action.
- You have signs of ketoacidosis, dehydration, or other serious problems, such as increased drowsiness, seizure, abdominal or chest pain, difficulty breathing, fruity odor to breath and dry cracked lips, mouth or tongue.
- When you are uncertain about what you need to do to take care of yourself.

* Always follow your HCP's recommendations.

Foods that contain 15 grams of carb

- ½ cup apple juice
- ½ cup regular soft drink (caffeine-free and not “diet”)
- 1 Popsicle® stick
- 5 Lifesavers® candies
- 1 ounce slice dry toast
- ½ cup cooked cereal
- 6 saltine crackers
- ⅓ cup frozen yogurt
- 1 cup Gatorade® sports drink (replaces electrolytes)
- ½ cup regular ice cream
- ¼ cup sherbet
- ¼ cup regular pudding
- ½ cup regular gelatin/Jell-O®
- 6 ounces yogurt (not frozen) artificially sweetened or plain
- Milkshake (½ cup lowfat milk and ¼ cup ice cream)

Reference: The Art and Science of DSME Desk Reference, 2nd edition. Editor in Chief – Carole Mensing, RN, MA, CDE, FAADE. 2011 AADE, Chicago, Illinois



If you are not feeling well, it may be difficult to tell if it is due to illness or because you are not getting your infusion of insulin. You should always check for ketones if your stomach is upset or you feel nauseous.



Test your knowledge:

1. I am not feeling well and I don't have any appetite. I should remove my insulin pump.
True / False
2. I should check my BG every _____ hours when I am sick.

Physical activity

Insulin needs change during exercise or whenever your activity level is higher (or lower) than usual. Learning how to think and act like a pancreas is crucial to help you maintain optimal BG control. Using an insulin pump offers you one of the best ways to match your insulin needs during these times. It is important to realize that the same activity can have very different effects on BG from one person to another. There are even times when the same activities can result in different effects in the same person!

When you first start on the pump, your HCP may ask you to refrain from doing exercise for a little while. This may be helpful as everyone (including you) is working to get your basal rates on target. If you have a very consistent exercise routine, this becomes less of an issue. Check with your HCP for specific recommendations.

In general, during increased physical activity, BG levels drop and you need less insulin. This is because your body is working harder and uses up glucose for the extra fuel the muscles require. In people without diabetes, the body automatically reduces the level of insulin during exercise. People with diabetes need to either adjust their insulin or eat extra food to maintain target BG levels when exercising. Insulin pump wearers have the ability to spontaneously and precisely adjust insulin levels.

You can either program your Animas® pump with a temporary basal rate before your activity level increases (for example, set a temporary basal of – 50% for 2 hours which will reduce your basal insulin in half), or you can decrease your carb bolus at the meal or snack before you exercise. You may find it works best to do both. It is important to know that exercise can actually lower BG for up to 36 hours. This is called the “lag effect.”

BG levels sometimes rise during exercise. During very high intensity exercise and/or competitive events, stress hormones are released. These hormones trigger stored glucose to be released into the bloodstream. Many times this high glucose will come down to target on its own a short time after the exercise. It is important for you to check with your HCP for specific recommendations. (See the next section, General Exercise Tips.)

In other cases, if your BG is high prior to exercise and insulin levels are low, your BG level can rise with the increased activity. The low insulin level will trigger your liver to release stored glucose. Since the insulin level is low, the extra glucose cannot enter the cells and eventually ketones will be released as your body resorts to breaking down fat to meet the muscles' need for energy. This is a dangerous situation. (Refer to the section on DKA, page 30.)



Physical activity can affect BG levels differently in different people. Check BG levels before, during and after exercise to learn what your personal response will be. Keep in mind that your glucose response will also vary based on the type, intensity and the duration of the activity.

General Exercise Tips

Follow these suggested guidelines when activity is increased:

- Before you begin exercising with an insulin pump, talk to your HCP to get help on adjusting your insulin doses.
- If your BG is 250 mg/dL or greater prior to exercise, check to see if you have ketones. If ketones are present, refer to the guidelines listed on page 32. Your HCP may advise that you do not exercise when you have a positive ketone test—follow their guidance.
- Wear medical identification.
- Check BG before, during and after activity to establish your specific patterns. Keep written records!
- Try the same exercise at different times of the day to see if your glucose response differs depending on the time of day.
- Carry carbs to treat low BG.
- Drink plenty of water to stay properly hydrated.
- Consult with an exercise specialist who is experienced with diabetes management.

Insulin Adjustment Tips

These are just some general tips to consider. Remember to consult your own HCP for specific guidelines.

- In general, exercise lasting longer than 30 minutes will require extra carbs or a decrease in insulin.
- Adjust the insulin that has the greatest effect during the exercise session: basal insulin or the bolus dose.
 - If you are exercising within an hour or two of a bolus, decrease the bolus.
 - If your exercise is not close to a bolus, consider a basal adjustment using the Temporary Basal Rate. (See the advanced features section of this workbook on page 62.)
 - You may find adjusting both basal and bolus insulin is best for you.
- When possible, set your temporary basal rate 30 to 60 minutes before you increase your activity.
- Remember, because of the “lag effect” of exercise, you may need to decrease insulin for as long as 24 to 36 hours after the exercise. This is especially true for activities that last for several hours or more.

Wearing or Disconnecting the Pump During Exercise

Many new pumpers ask if they should disconnect during exercise. There is no right or wrong answer as your decision depends on your individual comfort and the specific situation. Here are some tips on pumping and exercise:

- Body heat, perspiration, moisture, friction, and agitation may irritate the infusion site. Choose a site that will not be flexed or irritated during the exercise. Wear the pump away from the infusion site to avoid rubbing and friction. Remember that perspiration may affect the infusion set tape as well. Check your infusion site and tape carefully.
- If you are having difficulty keeping your infusion sets attached to your skin, discuss with your HCP or contact Animas® Customer Support at 1-877-YES-PUMP (1-877-937-7867) for a list of products that may help this problem.
- It is usually recommended to remove the pump during contact sports. Do not remove the pump for longer than 1 hour without a plan for insulin replacement.
- There are many cases and protective covers to keep your pump safe and comfortable during exercise. Visit the Animas.com website for ideas and to view accessory items.



Test your knowledge

1. I usually need less insulin when I increase my activity level. True / False
2. Listed are two steps I can take to prevent low BG with exercise: _____

3. Physical activity will cause the same results in anybody with diabetes. True / False

Record keeping

Detailed record keeping is very important when you are starting on pump therapy and working with your HCP to adjust your settings. For many people, it is also one of the most challenging tasks when starting pump therapy. Without recording the details of your day—every day—it is nearly impossible for you and your HCP to make proper adjustments to your basal rates and bolus dose formulas. Without a doubt, record keeping can be time consuming, but it is a necessity in order to get the most out of pump therapy. Make a list of everything you know that can affect your BG.

Now you know what you need to record in your pump records! Your list should include the following:

- BG readings
- Foods/drinks consumed, grams of carbs, and whether the meal was cooked at home or at a restaurant
- Bolus doses (carb and BG corrections)
- Basal rates
- Exercise or other events that increase your activity level
- Temporary basal rates
- Menstrual cycle
- All low BG reactions
- Unusual stress
- Any illness or just not feeling well
- When you change your infusion set/site
- Ketone checks and results
- Day of the week (this is important since many people will notice differences in glucose level weekdays versus weekends)
- Any schedule changes
- Consumption of alcohol
- Change in medication

Reviewing this list should make it obvious that simply downloading your BG meter and/or insulin pump is probably not adequate...at least at the beginning stages of pumping. Pump download software can help at the beginning, as well as in the future, by supplementing your written records.

There are “pump flow sheets” to help you to organize all of your data in a meaningful way. See Appendix 5 at the end of the workbook for some versions you can photocopy. Be sure to check with your HCP as they may have a certain format that they prefer you to use.

In order for records to be useful, you need to be as accurate as possible. For example, if you forget to write down a low BG episode, this can change how you and your HCP interpret the data. Keeping records with you and keeping notes as things happen are the best ways to ensure accuracy. Take five minutes each evening to review your BG meter and pump history and double check this information against your written records.

As a new pumper, be prepared to keep these detailed records for at least one month. It is a good idea to keep some detailed records from time to time to make sure everything is still okay or when you need to focus on a certain problem you are having. Always plan to keep written records for a few weeks before any visit with your HCP. This will make the best use of your planned visit.

Wearing the pump

Aside from actually operating your insulin pump and learning how to use it to manage your diabetes, one worry for many new pumpers is finding the best way to wear it in different situations. Fortunately, you have many options with a long list of accessories! Here are a few ideas to get you started:

Day-to-Day

- If you are wearing pants, shorts, or a skirt, clip the pump to your waistband using one of the accessory clips that came with your pump.
- Put your pump in your front pants pocket. If you are wearing a belt, you can put the tubing under your belt and then in your pocket.
- Many women put the pump in their bras. You can put the pump into a baby sock to help with sweating and irritation or try other accessories available from Animas.
- If you are wearing a dress or a loose shirt, try the waist-oriented accessories available from Animas to hold your pump under your clothing.
- Put your pump in your sock for easy access.
- Sew a pocket on the inside of a piece of your clothing and place the pump inside of the pocket.

Exercise

- For activities that are not too intense, clip the pump on your waistband.
- For more intense exercise, accessories are available from Animas which will secure your pump around your waist. It is similar to a fanny-pack, but less bulky. It also has an extra pocket to carry a BG meter and glucose tablets.
- For contact sports, it is best to disconnect your pump. (See the section on Physical Activity on page 39.)

Sleeping

- Place the pump near or under your pillow. Some people keep the pump on the night stand, which may require longer length tubing.
- Clip the pump to your pajamas, put it in a pocket, and see Animas.com for other accessories popular for sleeping.

Swimming

- Animas® pumps are waterproof for 24 hours in 12 feet of water under normal swimming conditions. You should not wear your pump while scuba diving or while using high diving boards.
- Make sure you change your battery compartment cap as directed in your Owner's Booklet and that the o-ring on the cap is not dried out or broken.
- Your pump should not be taken into hot tubs or hot baths as the extreme temperature can adversely affect insulin quality.
- Do not remove the pump for longer than one hour without a plan for insulin replacement.
- If you suspect your pump may have been damaged or otherwise had its waterproof integrity compromised, DO NOT use in water. Call Animas Customer Support at 1-877-YES-PUMP (1-877-937-7867) for assistance.

Intimacy

- For intimate times, you can disconnect from your insulin pump. Do not remove the pump for longer than one hour without a plan for insulin replacement.
- Don't forget to reconnect! If you are concerned that you may forget to reconnect, put your pump in Suspend mode. While in Suspend mode your pump will beep or vibrate as a reminder to reconnect.

Section 3: The first few weeks to months

Now that you've mastered the basics of pump therapy, it's time to move to the next step. Fine tuning your pump settings and using advanced pump features will enable you to maximize the benefits of pump therapy. This section of the workbook will focus on how to evaluate your doses (basal rates, I:C, ISF) and to begin working with your HCP to adjust the initial estimates that were made when you started on the pump.

Topics covered in this section include:

- Evaluating and fine tuning basal rates
- Evaluating and fine-tuning bolus dose formulas

Evaluating and fine-tuning basal rates

The goal for basal insulin is to help keep your BG stable without the need for extra food or insulin. For example, you should be able to skip a meal without having to snack to prevent a low BG.



Basal rates that are accurately set should keep your BG relatively stable in the absence of food, exercise or extra insulin.

Initially, your basal rate(s) is estimated by your HCP. Soon after starting pump therapy, your basal rate will need to be fine-tuned and other basal rate segments will likely be added to your basal program. Remember, you can have up to 12 different basal rates in one program.

To evaluate your basal rates and to see where you might need changes, you will need to check BG levels often. You will also need to try to eliminate other factors that may affect your BG levels, including food, bolus insulin, and increased activity. See the information below and on the next page for some specific tips to help you evaluate your basal rates.

Tips to Evaluate Basal Rates:

Timing

- It is helpful to divide the day into 4 timeframes and evaluate one at a time: overnight, morning, afternoon, and evening. Start with overnight.
- Evaluations can begin 4 hours after the last bolus dose and the last food/drink was consumed. You may consume water during testing.

Food

- During daytime evaluations, you will need to skip a meal.
- The meal prior to the evaluation should be a predictable one. You should be certain of the number of carbs.
- The meal prior to the evaluation should be a low-fat meal.

BG

- Generally, your BG should be in a reasonable range at the beginning of an evaluation.
- A BG in the 100-150 mg/dL range is reasonable, but check with your HCP for your personal minimum and maximum range.
- Stop the evaluation if your BG values go above your maximum or below your minimum target range. Treat any low or high BG as usual.

Things to Avoid During a Basal Evaluation

- Do not disconnect from your pump and do not set a temporary basal rate.
- Do not plan a basal rate evaluation during events that might affect the results: illness, fatigue, unusual stress, or after severe low BG. For women, the menstrual cycle may have an effect.
- Prior to a basal rate evaluation, you should not drink alcohol.
- Prior to a basal rate evaluation, you may need to avoid exercise. If you exercise consistently (same type of activity, same time every day) then skipping your exercise session may not be necessary or even good to do. Check with your HCP.

The following chart will give you specific instructions for completing the different basal rate evaluations:

Evaluation time frames	Evaluation directions	When to check BG
Overnight	<ol style="list-style-type: none"> 1. Eat an early dinner and take your usual meal bolus. 2. Eat a predictable meal with a known number of carb grams. 3. Choose a low-fat dinner. 4. Do not eat after dinner. 5. Begin the evaluation about 4 hours after dinner if your BG is in a reasonable range. 	4 hours after dinner, Bedtime, Midnight, 2-3 am, Upon waking
Morning	<ol style="list-style-type: none"> 1. Begin the evaluation if your BG is in a reasonable range. 2. Skip breakfast. 3. Do not eat or drink until lunch. 	Every 1-2 hours, Upon waking until lunch
Afternoon	<ol style="list-style-type: none"> 1. Begin the evaluation if your BG is in a reasonable range 4 hours after breakfast. 2. Skip lunch. 3. Do not eat or drink until dinner. 	4 hours after breakfast, Every 1-2 hours until dinner
Evening	<ol style="list-style-type: none"> 1. Begin the evaluation if your BG is in a reasonable range 4 hours after lunch. 2. Skip dinner. 3. End the evaluation at bedtime and have a snack if desired (bolus as usual for your snack). 	4 hours after lunch, Every 1-2 hours until bedtime

Basal Evaluation Log

Use the following charts to help you pull together information from your basal rate evaluations. Begin evaluations if your BG is between ___mg/dL and ___mg/dL.

Overnight

Dinner carb/dinner bolus	Time	4 hours after dinner	Bedtime	12 AM	3 AM	Upon waking
	BG day 1					
	BG day 2					
	BG day 3					

Morning

Bedtime carb/ bedtime bolus	Time	Upon waking	Hour 1	Hour 2	Hour 3	Hour 4
	BG day 1					
	BG day 2					
	BG day 3					

Afternoon

Breakfast carb/ breakfast bolus	Time	4 hours after breakfast	Hour 1	Hour 2	Hour 3	Hour 4
	BG day 1					
	BG day 2					
	BG day 3					

Evening

Lunch carb/ lunch bolus	Time	4 hours after lunch	Hour 1	Hour 2	Hour 3	Hour 4
	BG day 1					
	BG day 2					
	BG day 3					

Before making adjustments to your basal rates, it's best to see a repeating trend in BG values. This means you should complete each of the evaluations a minimum of two times; three would be best. This may seem like a great deal of work, but the value of having appropriate basal rates will be worth it. You can work your basal rate evaluations into your busy schedule. For example, you may be too busy to stop for lunch one day. Plan to do a few extra BG checks and make it an afternoon evaluation!

Don't get frustrated! You may keep trying to do a particular evaluation but you can't because your BG "isn't cooperating." For example, each time you attempt an overnight evaluation, your BG after dinner is too high. You are still getting valuable data here...maybe the evening basal is too low, or maybe you need a bigger bolus to cover your dinner. This is something to discuss with your HCP.

Using the Data to Make Adjustments

The Basal Evaluation Logs in this section will help you to record the data you collect during your basal evaluations, or you may use Insulin Pump Flow sheets (see the chapter on Record Keeping, page 42) to record the data.

Example of Basal Evaluation Log

Afternoon

Breakfast carb/ breakfast bolus	Time	4 hours after breakfast	Hour 1	Hour 2	Hour 3	Hour 4
37g/2.45 units	BG day 1	149 mg/dL	119 mg/dL	115 mg/dL	100 mg/dL	86 mg/dL
45g/3.00 units	BG day 2	126 mg/dL	120 mg/dL	95 mg/dL	85 mg/dL	80 mg/dL
35g/2.35 units	BG day 3	135 mg/dL	103 mg/dL	97 mg/dL	90 mg/dL	79 mg/dL

Once you have done the work of collecting the data from your evaluations, it is time to study and use it to make useful changes. Initially you should check with your HCP prior to changing basal rates. You may get to the stage when you and your HCP feel you can make your own basal rate adjustments. The example basal log above indicates a drop in BG of more than 30 points with the largest drop starting at hour 1. A lower basal rate should be indicated during this time frame.

Here are some basic guidelines typically used to adjust basal rates:

- During a basal evaluation, BG changes of more than 30 mg/dL between readings indicate the need to adjust the basal rates.
- It is best to see a repeating trend on multiple days before making a basal change.
- Make basal changes in small increments, typically 0.025 to 0.100 U/hr.
- The basal rate should be increased or decreased 1-2 hours before the BG begins its rise or fall if using Novolog® or Humalog® in the pump. If you use a different type of insulin, check with your HCP for specifics on timing.
- Make one change at a time.
- Reevaluate that time frame after any changes to the basal rate are made.
- Your goal should be to find the basal rates that work the best most of the time. Don't expect perfection!

Last but not least, it is important to know that your basal rate needs are likely to change over time. It is a good idea to repeat basal evaluations if you start to notice your BG is not as well controlled as it has been before. Life changes such as divorce, graduation, school, or a new job may require reevaluation of basal rates. Also remember that you may need a different set of basal rates depending on different factors such as weekday versus weekend. (See the Advanced Features section for more discussion about this on page 57.)



Test your knowledge:

1. I can have up to ____different rates programmed into each of the 4 basal rate programs.
2. If my basal rates are set correctly, I should be able to skip a meal and not worry about a low BG. True / False
3. How long after my last bolus dose should I wait before beginning a basal rate evaluation? _____
4. I need to reprogram my basal rates every day. True / False
5. Listed are two important things to consider for the meal prior to doing a basal rate evaluation. _____

Evaluating and fine-tuning your bolus dose ratios

Your initial bolus ratios (I:C and ISF) were estimates and may need to be adjusted to reach your BG goals. Once your basal rates are fine-tuned, it is time to begin evaluating your bolus doses. Does your I:C ratio cover the carbs you eat? Does your ISF accurately correct high or low BG readings? Just like with evaluating basal rates, there are systematic ways to help you evaluate your bolus doses and determine what adjustments are needed.

Evaluating Your I:C Ratio

Directions	BG Checks
<ul style="list-style-type: none"> Basal rates should be evaluated and adjusted if necessary prior to evaluating your I:C ratio BG should be in target range before meal you are evaluating. You want to look at the I:C ratio alone Choose food with known carb amounts such as pre-packaged meals Choose low fat meals Do not evaluate during time of illness, stress, or after exercise unless this is your routine Evaluate all meals as you may find that you need different I:C ratios at different times of the day 	<ul style="list-style-type: none"> Check BG before meal Check BG hourly for the next 4 hours

Example of I:C Bolus Evaluation Log

Day/Date: Friday, Sept 24 Event: Breakfast I:C

	Before Meal	Hour 1	Hour 2	Hour 3	Hour 4
Time	7:00 am	8:00 am	9:00 am	10:00 am	11:00 am
BG	100	177	212	171	160
Carbs	50 grams				
Bolus	5 units (1:10 I:C ratio)				

The example above indicates that the bolus for the meal is not enough. The BG rose 112 mg/dL at 2 hours after the meal and the BG did not come down to an acceptable target BG when done working by hour 4. Therefore, the I:C ratio of 1:10 needs to be a lower number to give a larger bolus for each gram of carb. With any insulin adjustment, you want to see trends before making changes. This means you need to repeat the evaluation two to three times. It is helpful to evaluate meals at different times of the day; you may discover that your ratio doesn't work the same at different mealtimes. You may want to start with testing your breakfast ratio first one week followed by lunch the next and so on until you have found the ratio that works best for each meal or timeframe.

Evaluating the Results

- Expect your 2 hour post-meal BG to be 40-80 mg/dL higher than your before-meal BG.
- If BG returns to target 4 hours after meal, I:C ratio set correctly.
- If BG is above target 4 hours after meal, increase amount of insulin needed to cover the carbs in that meal by lowering the I:C number (eg, if on 1:15, change down to 1:13).
- If BG is below target 4 hours after meal, decrease amount of insulin needed to cover the carbs in that meal by raising the I:C number (eg, if on 1:14, change up to 1:16).

Check with your HCP for I:C dose adjustment.

Evaluating Your Insulin Sensitivity Factor(s)

Evaluating your ISF is similar to evaluating your I:C ratio. Isolate the effects of your ISF by eliminating other variables. The goal is for your ISF to return high BG to your target range within four hours of a correction bolus. Follow the general guidelines below to evaluate your ISF, and take note of the specific steps.

Directions	BG Checks
<ul style="list-style-type: none"> <input type="checkbox"/> Basal rates should be evaluated and adjusted prior to evaluating your ISF <input type="checkbox"/> Start 4 hours after previous bolus and when you can plan to not eat for 4 hours <input type="checkbox"/> Start when BG is above target (at least 40-50 mg/dL) <input type="checkbox"/> If BG is higher than 250 mg/dL, be sure to troubleshoot high BG before starting evaluation. If you have ketones, postpone evaluation and treat high BG <input type="checkbox"/> Do not evaluate ISF during time of illness, or unusual stress <input type="checkbox"/> Do not evaluate if you have exercised within the past 24 hours, unless this is your usual routine <input type="checkbox"/> Calculate and deliver BG bolus using your ezBG feature <input type="checkbox"/> If BG drops below 70 mg/dL during evaluation, stop and treat low <input type="checkbox"/> You may want to evaluate ISF at different times of the day 	<ul style="list-style-type: none"> <input type="checkbox"/> Check BG prior to taking correction dose <input type="checkbox"/> Check BG hourly for 4 hours

Example of ISF Bolus Evaluation Log

Day/Date: Tuesday, March 6 Event: Overnight ISF

	BG before correction dose	Hour 1	Hour 2	Hour 3	Hour 4
Time	12:00 am	1:00 am	2:00 am	3:00 am	4:00 am
BG	220	199	170	155	140
ISF/Target	1:50, 120				
Bolus Correction	2 units				

The example above indicates that the correction bolus is not enough since BG remains above target 4 hours after correction. An ISF of 45 might work better.

Evaluating the Results

- If BG returns to target by 4 hours, your ISF is correct.
- If BG remains higher than target, your ISF needs to be decreased to give more bolus insulin.
- If BG becomes lower than target, your ISF needs to be increased to give less bolus insulin.

Adjust your ISF slowly. For example, if you use an ISF of 50 and your BG remains higher than target, try using an ISF of 45.

You may discover that you need a different ISF at different times of the day. You may also need more correction insulin than usual when you have very high BG (over 250 mg/dL), have ketones, or are ill. Many people choose to use a different ISF during bedtime hours to be more cautious with corrections when they are sleeping.



As with any insulin adjustment, check with your HCP before changing your I:Cs or ISFs.

Bolus Dose Evaluation Logs

Use the following charts to help you pull together information from your bolus dose evaluations.

I:C Ratios

Day/Date: _____ Event: _____

	Before meal	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Bolus					

Day/Date: _____ Event: _____

	Before meal	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Bolus					

Day/Date: _____ Event: _____

	Before meal	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Bolus					

ISF

Day/Date: _____ Event: _____

	BG before correction dose	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Correction Bolus					

Day/Date: _____ Event: _____

	BG before correction dose	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Correction Bolus					

Day/Date: _____ Event: _____

	BG before correction dose	Hour 1	Hour 2	Hour 3	Hour 4
Time					
BG					
Carbs					
Correction Bolus					

Section 4: Advanced pumping features and topics

Now that you have mastered the basics, you may be ready to focus on some advanced pumping topics. You may already be using some of these features, depending on your individual readiness, goals for pumping, as well as your HCP's recommendation.

This section will focus on some of the advanced features in your Animas® insulin pump and offer some tips on how to use the features to help you manage your diabetes. Features covered include:

- ezCarb
- Food database
- ezBG
- IOB
- Extended and Combination ("combo") Bolus
- Temporary Basal Rates
- Multiple Basal Programs
- Time off the pump

Always check with your HCP before using these features. Refer to your Owner's Booklet to learn how to activate, program, and use these features.

ezCarb

You already learned how to calculate your bolus dose for food based on your I:C ratio. You simply divide the estimated grams of carbs you will eat by the "C" number of your ratio. For example, if your I:C ratio is 1:15 and you are planning to eat 45 grams of carbohydrate, you would bolus 3.0 units (45 grams of carbs ÷ by 15 {I:C} = 3.0 units of insulin). This was an easy example...you could probably do the math in your head! But it won't always be this easy. The great news is that your insulin pump can do this math for you if you use the ezCarb feature!

Simply activate (turn on) this feature in your Advanced Setup menu and program your individual I:C ratio (or ratios) in Advanced Setup. At times when you may choose to temporarily change your I:C ratio at a meal/snack, you will be able to adjust your I:C ratio in the ezCarb screen on the Bolus menu. This would be useful when you are in need of decreasing your meal bolus (on a one time basis) to compensate for a planned walk afterward.

See your Owner's Booklet for details on activating and using the feature or call Customer Support at 1-877-YES-PUMP (1-877-937-7867). You can program different I:C ratios for different time frames. Some people find that they get better glucose results when they use different I:C

ratios at different times of the day. Talk to your HCP if you think you would benefit by doing this.

Note that you can edit (change) your ratio right on the ezCarb screen. For example, you are eating breakfast at 9:00 am and you are planning a long walk after you eat. Your usual I:C ratio at this time of day is 1:15, but because you will be taking a long walk, you reduce your breakfast bolus by using a ratio of 1:20. You can edit your 1:15 on the ezCarb screen so it will calculate using 1:20 instead of 1:15. Editing your I:C ratio on the ezCarb screen will not change the default values you entered during Advanced Setup. To change permanently, you would need to reprogram in the Advanced Setup.

In addition to entering your carb grams into ezCarb, you can also enter a BG value and your pump will calculate a BG bolus for you. ezCarb will add both bolus values (carb bolus and BG bolus) to give you the suggested total bolus.

ezBG

You already know how to calculate a bolus to correct a BG. With ezBG you can store your BG targets and ISFs in Advanced Setup. Enter current BG and your pump will use this information to calculate a recommended BG bolus. If the IOB feature is activated, your pump will calculate a reduced bolus dose based on recent boluses you have taken. We will talk more about the IOB feature next.

With the Advanced Bolus Features turned on, ezBG is available from the Bolus menu. To program your individual BG targets and ISFs, go to the Advanced Setup Screens. Note that you can edit your BG target and ISF right on the ezBG screen if you need to make a one time change to your correction bolus calculation. Changing ISF or BG target on the ezBG screen will not change the default values you entered during Advanced Setup. To change permanently, you will need to reprogram the Advanced Setup Screens.

Note that if you enter a BG below 70 mg/dL or above 250 mg/dL, your pump will give you an alert reminding you that special attention must be given to your BG at these extremes.



- Use ezCarb when you are eating, OR when you are eating AND checking your BG
- Use ezBG when you are not eating, but are checking your BG and need a correction bolus

IOB

IOB is a feature that allows you to track the rate at which your body uses your bolus insulin. Even with rapid-acting insulin, your body takes some time to use your entire bolus insulin. IOB is designed to allow you to safely give a correction bolus without “stacking” your insulin, which could lead to a low BG later.

If IOB is activated in your pump, it tracks and displays how much of that bolus is still working to lower your BG. You can activate IOB and set your personal IOB duration in the Advanced Set-up Menu. See your Owner’s Booklet for instructions. Your pump will track each bolus over the period of time that you programmed it for. It will use this data to calculate and recommend a reduced bolus dose if you are calculating a BG bolus by using ezBG, or if you add a BG to an ezCarb bolus.

Points to remember:

- IOB will track ALL bolus doses you take for a given amount of time.
- You can customize the time frame that IOB will track your bolus doses, ranging from 1.5 to 6.5 hours.
- The duration setting for IOB is the point at which insulin is finished working in your body. This setting varies from person to person and can be affected by other factors.
- Talk to your HCP about using this feature and for suggestions on an appropriate time frame for you!
- IOB only tracks BOLUS insulin. Basal insulin is NOT involved in IOB tracking or calculations.
- If your BG is above target, IOB will only be subtracted from BG (or correction) boluses, NOT from carb boluses.
- If your BG is below target, IOB is subtracted from carb boluses (if you are entering carbs and a low BG).
- If you change your battery, any IOB will be cleared. The pump cannot detect how long a battery is out, so it cannot accurately track how much insulin is still on board.

Remember, the pump is great at delivering insulin and calculating your bolus doses, BUT you still need to think for yourself. For example, IOB cannot factor in what type of meal you had last...what if it was high fat? Sometimes, even with a BG in your target range and a significant amount of IOB, you may still see a higher BG later if you ate high-fat foods and/or foods with slower-digesting carbs. The pump also doesn’t know your activity level.



You can find out how much insulin is on board anytime you want by looking at the pump status screen. Consider this example to see why this may be useful: It is bedtime and your BG is 100 mg/dL. Your status screen shows that you still have several units of IOB. You may wisely decide to have a small snack without a bolus to prevent a low BG while sleeping.

IOB Q & A

Q: You eat lunch at noon and bolus for your food as usual. It is now 1:30 pm and you want to eat a banana. You are not checking your BG at this time. Should you reduce the carb bolus for the banana since you just bolused for lunch 30 minutes ago?

A: No! You are eating more carbs so you need to cover all of the carbs. It does not matter when you last bolused in this case. Your pump will not even show you IOB in the calculation since you are only entering a carb amount.

Q: You ate lunch at noon and bolus for your food as usual. It is now 1:30 pm and you check your BG and find it to be high. Should you take your usual BG bolus using your ISF and target?

A: No! If you do this, you risk having a low BG shortly after. The insulin you took for lunch is still working on the glucose from the meal (it is still “on board”). In fact, this insulin is peaking now. Your pump will still calculate a correction dose using your ISF and target; however, it will reduce this correction by the amount of IOB.

Combo Bolus

By using the combo bolus feature, you can tailor your bolus delivery to better match your meal content, eating pattern or health needs. Terms associated with combination boluses include:

1. **Normal bolus:** bolus delivered immediately
2. **Extended bolus:** bolus delivered slowly over a selected time, from 30 minutes to 12 hours
3. **Combo bolus:** a normal bolus + an extended bolus
4. **Duration:** the length of time the extended bolus will be delivered

Spreading out a bolus dose (or part of a bolus dose) can be very useful for matching your insulin bolus to high-fat foods or meals since these foods can delay digestion. Extending a bolus may also help with “grazing” over a few hours and for carbs that are digested more slowly such as high fiber foods. Extending a bolus can also help those who have gastroparesis or delayed digestion.



Combo Boluses often are helpful when eating pizza, Chinese, Mexican, and Italian meals and many meals eaten at restaurants.

For the greatest benefit, people will use this feature according to their individual needs.

The same person may use the feature differently for different types of foods/meals. There is really no right or wrong way to use this feature, which does make it difficult to give specific recommendations. By frequently checking your BG after eating, you will see patterns develop. The combo bolus feature will help you better cover these types of meals.

In order to use this feature, you need to activate it in your Advanced Setup menu. If you already turned on Advanced Bolus Features, you will now be able to program a combo bolus. See your Owner's Booklet for details on programming a combo Bolus.

Talk to your HCP about when you should try this feature and for specific guidelines on how to start using it. Recording BG levels and a food diary on your Pump Flow Sheets will help you see any patterns which indicate this feature may be useful.

Combo Boluses: Guidelines and Helpful Hints

When programming a combo bolus, two options must be selected: the "split" of normal vs. extended and the duration, or amount of time, the bolus will be delivered. There is no perfect combination bolus rule that will work for everyone. Each individual will need to adjust their bolus delivery according to their specific need and their HCPs' recommendations. The following information is intended as a guideline only. Always review the data you obtain with your HCP before making any changes.



If you need to correct a BG, be sure to deliver the correction insulin as part of the normal portion of the combo bolus to help bring BG to target quickly.

Combo Bolusing Guidelines

1. Begin with a 50%/50% split.

- a. 50% Normal Bolus
- b. 50% Extended Bolus over a 2 hour period

Example: Eating at 6 pm

Meal contains: 60 grams carb (If using a 1:10 I:C ratio) = 6 units

50% Normal = 3 units

50% Extended = 3 units

2. Check BG 2 hours after meal. The purpose of this 2 hour check is to see if the first portion of the bolus—the 50% or Normal Bolus was the correct amount needed to maintain normal BG levels 2 hours after the meal. If BG is above target, try 60% / 40% split the next time you eat that meal.

Example: Meal contains 60 grams of carb. (If using 1:10 I:C) = 6 units

60% Normal = 3.5-4 units

40% Extended = 2-2.5 units

Note: If 2 hour post meal BG is high after trying 60% / 40% split, try a 70% / 30% split the next time you eat that meal. Continue this until you reach the right combination.

3. Check BG 4 hours after meal. The purpose of this 4 hour check is to see if the 2nd portion of the bolus—the Extended Bolus was the correct amount needed to maintain normal BG levels 4 hours after the meal. If BG is above target increase the amount of insulin given over

the 2 hour extended bolus the next time you eat this meal.

4. Check BG 6 hours after meal. The purpose of this 6 hour BG check is to see if the 2nd portion of the bolus—the Extended Bolus was the correct amount of insulin needed and the right length of time needed to deliver the extended bolus to maintain normal BG levels 6 hours after the meal. If the BG was normal at the 4 hour check but high at the 6 hour check, the extended portion of the bolus may need to be increased slightly—and the length of time may need to be extended from 2 hours to 3 or 4 hours. If the BG was in range at the 4 hour check and at the 6 hour check—CONGRATULATIONS!!!!

Temporary Basal Rates

The Temporary Basal Rate feature can be very useful for sick days or when your usual activity is different from the norm. Temp Basal allows you to adjust your basal rate temporarily without actually changing your basal program. The duration of temporary rates can be adjusted from 30 minutes to 24 hours in 30 minute intervals and in 10% increments (as low as -90% and as high as +200% or you can even set the basal to “off”). It is best to set the temporary rate 30 minutes to 1 hour before you really need it. Due to the action of insulin, there is always a bit of a lag time before the new rate will have an effect in your body.

Experienced pumpers use this feature for the obvious reasons like exercise and the not so obvious reasons like a long car ride or a plane trip.

Multiple Basal Programs

Your Animas® pump lets you program multiple basal programs. Each program can have multiple basal rate segments throughout the day. Why use different basal programs? Perhaps you have done your basal evaluations but still have some problem areas: your glucose control may be in range during the week, but you may experience many low BGs during the weekend. It could be you have a sedentary job, but on the weekends you are much more physically active. This is a perfect example of when using different basal programs would help you.

Time off the Pump

Certain situations may require the need to disconnect from your pump for an hour or even for a few days. Reasons for this may include intimacy, contact sports, a medical procedure, or even a pump malfunction. It is important that you have a good understanding of what you need to do to keep your BG under reasonable control during this time. In general, you need to have a plan to replace both your basal insulin and your bolus doses if you are disconnected for longer than one hour.

There are many different ways to handle time off the pump when it involves a full day or more, so talk to your HCP for their specific recommendations. Covering bolus doses is easy; just calculate them as usual and inject insulin by syringe instead of the pump (you will need to

round off your doses). Covering basal insulin is trickier. You may want to keep a vial or pen (or a prescription for either) of intermediate- or long-acting insulin on hand just in case. Remember, if you do use intermediate- or long-acting insulin to replace your basal rate from your pump, you will need a plan to wean yourself off of this insulin before starting on your pump again. The temp basal feature can be useful in this instance.



In case you want or need to be off of your pump for a period of time, be prepared!

- Talk to your HCP now about a back up plan for time off the pump.
- Keep a written copy of your back up plan in an accessible place.
- Keep a written record of your current basal rates and bolus dose formulas.

Section 5: Continuous glucose monitoring

A continuous glucose monitor (CGM) is a device that measures glucose levels throughout the day and night, including while you're sleeping. The monitor can provide up to 288 glucose measurements every 24 hours, meaning you're getting a much better idea of how your BG is trending, minute by minute, hour by hour. Compared to a traditional glucose meter test, which is a snapshot in time, CGM is a way to see what is happening between individual BG meter tests. This way, you can observe levels, trends, and patterns that may not have been detected before. CGM systems measure glucose in the fluid in between cells rather than glucose in the blood. CGM systems are calibrated regularly using fingerstick readings from your BG meter. Insulin doses and treatment decisions are determined from BG meter readings, not from CGM readings.

A CGM might be helpful for someone who:

- is unaware when low BG levels occur
- tends to run higher than desired BG levels in fear of low glucose
- experiences out of range BG levels overnight
- desires tighter BG control around meals
- desires BG information around the time of physical activity
- is interested in BG trend information

There are three main components to a CGM system: the Sensor, the Transmitter, and the Receiver.

Sensor: The sensor is a small, flexible wire which is placed just beneath the skin with a guide needle. The guide needle is immediately removed after the sensor is placed. Adhesive tape holds the sensor in place.

Transmitter: The transmitter snaps into the sensor pod (small base of the sensor attached to the abdomen that holds the transmitter in place). The transmitter gathers information from the sensor and sends it wirelessly to the receiver.

Receiver: Data is sent to the receiver, either a cell phone-like device or a pump, which collects glucose information from the transmitter. The receiver typically displays the following glucose information: glucose trend-wave, current glucose level, trend arrows which show the direction and speed of glucose change.

How can I benefit from a CGM System?

Traditional BG testing provides a measurement of your BG level at the time of testing. CGMs

measure glucose multiple times per hour. A glucose value is only one component of what you need to know about your glucose to make the best diabetes treatment decision. CGMs also provide information about the trend of your glucose level over time. Trend arrows on the receiver indicate the direction and rate at which your glucose level is changing. Trend graphs show glucose levels over the past 1 to 24 hours.

With proper and frequent use, a CGM may help you:

- reduce your A1c levels without increasing the frequency of low glucose
- increase the amount of time that your glucose is in target range
- increase your knowledge related to the effect of food, insulin, stress, and physical activity on glucose control
- increase your awareness of glucose trends, including a rapid increase or decrease in glucose levels

Wearing the CGM

The sensor insertion site must be properly placed and maintained. Clean the insertion site as directed by the manufacturer. The sensor is inserted into the fatty layer just underneath the skin. The abdomen is the most common insertion site, but refer to your CGM user guide and HCP for specific instructions. The sensor should be placed at least three inches away from an insulin pump infusion site and away from any scars, tattoos, moles, or beltline area where clothing may rub.

The high and low glucose alert settings should be discussed with your healthcare team before you use your device. Being alerted at the same time of day on consecutive days may suggest the need to change insulin doses. Discuss these patterns of high or low glucose alerts with your HCP.

Calibration

Calibration is the process of transferring a fingerstick reading into the CGM device. This process is needed for the CGM device to display continuous glucose readings and trend information. Precise calibration is the key to CGM accuracy. During calibration, the CGM device uses a complex math formula to convert BG readings to CGM readings. When calibrating the CGM, be sure to use:

- an FDA approved BG meter that has been quality checked with control solution
- the same BG meter for all calibrations
- clean hands—wash with soap and water and dry thoroughly prior to performing a fingerstick
- blood from your finger as opposed to blood from an alternate site.

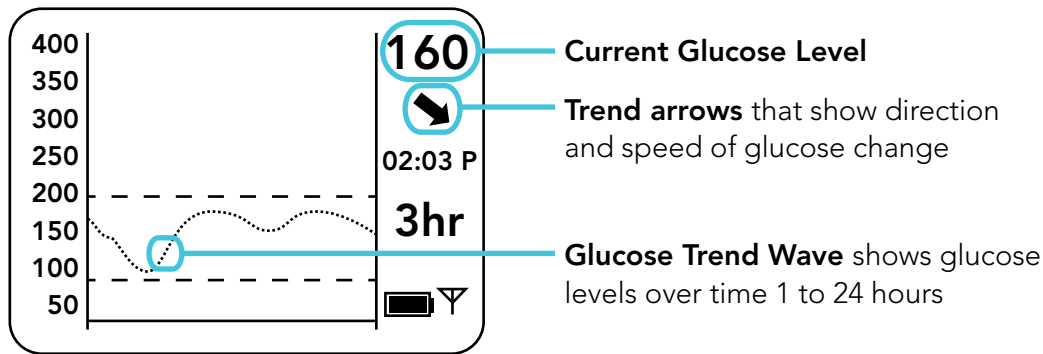


Calibration is one of the most important skills associated with using a CGM. Even with proper calibration it is common for the glucose values on the CGM and on the BG meter to be slightly different.

Using your CGM Information

Glucose readings from a CGM must not be used to determine treatment or insulin dosing decisions. Glucose readings from a BG meter need to be used to determine insulin doses.

Daily data for up to a 24 hour period can be viewed on the CGM receiver. Weekly, monthly, and quarterly data can be viewed using CGM software on a computer. When interpreting information from the Receiver, consider the trend arrow information first, the trend wave information second, and the glucose value third. Do not react only to the trend arrows. Remember that glucose levels on your CGM receiver and BG meter may not match exactly.



With a calibrated CGM device you and your healthcare team can have confidence in the data you are receiving. The CGM software on a computer can be used to review:

- patterns of low glucose
- patterns of overnight glucose control
- glucose control around meals
- effects of physical activity
- reaction to stress, illness, medication, and other factors
- successes in glucose control

Some CGM devices allow you to mark times when you eat, exercise, give insulin, or even circumstances such as illness or menses. Using these event markers provide valuable information to your healthcare team. Also discuss with your healthcare team how often they would like to review your CGM data. Use your system consistently and over time to maximize its effectiveness as a learning tool.



Test Your Knowledge

1. In order to increase his physical activity, Bob started walking after dinner several evenings a week. He notices that on the evenings he walks the low glucose alert on his CGM device awakens him in the middle of the night. Bob has confirmed these low glucose alerts with his BG meter and treated his low glucose appropriately. What

- should Bob do now to help prevent lows in the future?
- a. Discuss with his healthcare team using the temporary basal rate feature on his pump when physically active.
 - b. Leave his CGM device out of range when sleeping to avoid being awakened by alarms.
 - c. Eat a hearty snack before bedtime.
 - d. Remove his insulin pump before bedtime.
2. Sally went out for breakfast and ate pancakes and eggs. Two hours after taking her insulin and eating, her CGM reads 216 mg/dL. She is concerned about the post meal high glucose and wants to give herself a correction bolus to bring her glucose into target range. What is her next step?
- a. Go to the ezBG feature in her smart pump and enter 216 mg/dL as her current glucose value.
 - b. Give herself a quick 2 units of insulin to lower her glucose.
 - c. Take a fingerstick reading. Enter that reading into the ez BG feature of her smart pump to determine what, if any, insulin dose is needed to bring her back down into her target range.
 - d. Drink a lot of water to help avoid dehydration.

Appendix 1: Insulin details

Rapid acting insulin is approved for use in an insulin pump. The rapid acting insulins that are currently available are Humalog® (lispro) or NovoLog® (aspart).

Only U100 insulin is approved for use in an insulin pump. Other insulin can cause significant health risks. Contact your HCP for more information.

Onset, peak, and duration of insulin*

Onset – when it starts working

Peak – when it is working the hardest

Duration – how long it is continuing to work

Rapid-Acting:	Onset	Peak	Duration
Humalog®/NovoLog®	15 min	30-90 min	3-5 hr

Insulin storage

This information is provided for reference only. Refer to your insulin manufacturer’s label for complete product information.

Insulin is sensitive to heat, cold, and sunlight. Take care to store insulin according to manufacturer’s recommendations. Do not use insulin that is expired or appears discolored, cloudy, and/or clumpy. Refer to manufacturer’s label for complete instructions.

Precautions:

Talk to your HCP if you have any of these conditions and are on insulin:

- Trauma
- Vomiting
- Nausea
- Fever greater than 100 degrees
- Hypoglycemia/Hypoglycemia Unawareness
- Hyperglycemia
- Thyroid disease
- Severe infection

If you are having severe pain at the injection site, redness at injection site, a rash, or itching, contact your HCP.

*Reference: National Diabetes Information Clearinghouse <http://diabetes.niddk.nih.gov/>.

Other significant reasons to speak with your HCP:

- Renal (kidney) disease
- Hepatic (liver) disease
- Eating disorders (anorexia, bulimia, or compulsive overeating)
- Eye disease
- Cardiovascular (heart) and/or Peripheral Vascular (blood circulation in legs) Disease
- Gastroparesis (delayed stomach emptying)
- Unexplained Hypoglycemia and/or Hypoglycemia Unawareness (unaware of low blood sugar symptoms)

Possible causes of low BG while on a pump

- Basal rate programmed incorrectly
- Clock time incorrect on display
- BG bolus too large
- Low carb intake for bolus

- Improper timing of insulin bolus
- Alcohol consumption
- Did not suspend or use temporary basal rate for exercise
- Low carb intake prior to exercise
- Unplanned activity (ie, shopping)
- Long or intensive exercise
- Forgetting to disconnect at the site before priming the pump

Appendix 2: Infection prevention

Washing your hands and changing your infusion site are important for preventing skin problems and infections. Rotate your site and change your set every 2 to 3 days, or as recommended by your HCP. This will help prevent infections and elevations in your BG readings.

Inspect your site twice daily, once in the morning and once in the evening. Look for signs of infection such as:

- Drainage (clear, cloudy, white, yellow, or bloody)
- Unpleasant odor
- Redness or warm area
- Fever or chills
- Pain or discomfort at the site
- Unexplained hyperglycemia
- Nausea or vomiting

Make sure to report any of these symptoms to your HCP as soon as possible.

Tips to preventing skin problems and infections:

Wash your hands thoroughly with soap and water before and after handling pump supplies, site dressings, and/or medications.

Infusion sets should be inserted on clean skin. You may use an antibacterial soap solution, such as Dial™, Hibiclens®, or Betadine™. Cleanse the skin in a circular motion, from the inside to the outside. If needed, apply a skin protectant such as IV Prep™, Skin Tac™, or Mastisol® on a 3-inch diameter area. Allow your skin to dry naturally.

Inspect sterile packages to make sure contents have not been opened, are damaged, or expired. If the integrity of the package has been damaged, use another one and contact the manufacturer; they may want you to send the damaged package back.

Prescription medication or antibiotic ointment on discontinued sites may be needed. Consult your HCP if you are having problems with skin irritation or infection.

Appendix 3: Medical waste (US guidelines)

Daily diabetes care for an insulin pump user requires the use of lancets, needles, and syringes, which are referred to as “sharps.” Proper disposal will reduce the risk of injury to you and to others.

Dispose of sharp objects in a proper sharps container. Sharps containers should be closed and properly discarded when two thirds full.

The rules and regulations regarding sharps disposal are different in towns and counties throughout the country. If rules are not available for your community, follow the guidelines below.

- Never throw exposed sharps into trash.
- Never flush sharps down the toilet.
- Dispose of used needles, syringes, and lancets in a sharps container. If a sharps container is not available, a sturdy, puncture-proof, plastic container is acceptable in most communities.
- When your sharps container is two thirds full, seal it and put it into a trash receptacle. Make sure to label the container “USED SHARPS” with a heavy permanent marker.
- Do not overfill a sharps container.
- Syringes, needles, and lancets are not recyclable.
- When traveling, bring your used sharps home and dispose of properly. Pack them in a heavy duty container such as a hard plastic beverage bottle or pencil box, for transport.

Follow these additional guidelines to safeguard yourself and others:

- Store sharps disposal container out of reach from children.
- Never handle another person’s sharps unless a HCP has trained you in proper use and disposal.
- Do not recap or clip a needle that has been used by another person.
- Used tubing, cartridges without the needle, and other disposables can be discarded in regular trash receptacles.

Information on containers to use for sharps disposal can be obtained from <http://www.safeneedledisposal.org>, Centers for Disease Control, or ask your local pharmacist.

Appendix 4: Disaster conditions (US guidelines)

Any unexpected disaster such as floods, fires, hurricanes, tornadoes, earthquakes, and loss of electricity can occur and leave insulin pump users unable to manage their diabetes unless prepared. Being prepared for all types of emergencies just takes a little planning ahead.

Be Prepared for a Change in Routine

Disaster conditions may disrupt your daily routine, including when you eat.

- Be sure to check BG frequently
- Watch for signs of high or low BG

If you are not feeling well or are out of medication or food, call your HCP. If you are unable to reach your HCP:

- Go to the nearest hospital
- Contact the police
- Call the American Red Cross

Medical Supplies Emergency Kit

Pack enough for two weeks!

Check supplies every three months (watch expiration dates):

- Rapid acting-insulin
- Cartridges
- Infusion sets
- Alcohol swabs
- Site care supplies
- Batteries for insulin pump and BG meter
- BG meter and test strips
- Urine/Blood Ketone strips
- Lancets
- Glucose tablets
- Glucagon emergency kit
- Written prescriptions for all medications
- Insulated bag in case of loss of electricity
- Medical identification

- Emergency contact numbers
- All other medications

In case your pump is lost or damaged during the disaster, include the following in your emergency kit:

- Long acting-insulin (watch expiration date)
- Syringes
- Instructions for insulin use for times off of the pump

Hint: Keep emergency supplies in a waist pack under the bed. Make one for work, school, and vehicle. Please note that insulin should NOT be exposed to extreme heat or extreme cold and therefore never kept in your vehicle/ car.

Food Supplies

During any type of disaster, it may become difficult to get food and water. Here is a list of suggested supplies. Keep them in a dry place that will be easy to access.

Pack enough food and water for 1 week.

Check and replace supplies every year.

Food Supply Kit Suggestions

- 1 gallon water per person per day (at least one week)
- 6-pack canned fruit juice
- 1 bottle of glucose tablets or hard candy
- Canned tuna, chicken
- Nuts
- Saltine crackers
- 1 jar peanut butter
- Unsweetened cereal
- 6 cans fruit in light syrup
- Manual can opener
- Spoon, fork, and knife per person
- Disposable cups

Additional information on preparing for disasters can be obtained from the American Red Cross and the American Diabetes Association.

Appendix 5: Pump flow sheets

- Insulin pump flow sheet 5-day (pre-pump)
- Insulin pump flow sheet 4-day
- Insulin pump flow sheet 2-day
- Insulin pump flow sheet 1-day

5 Day Pre-Pump Flow Sheet



Name: _____ DOB: _____

Phone #: _____ Email: _____

Day/Date:	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
Activity/Notes:																						

Day/Date:	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
Activity/Notes:																						

Day/Date:	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
Activity/Notes:																						

Day/Date:	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
Activity/Notes:																						

Day/Date:	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
Activity/Notes:																						

Insulin Pump Flowsheet: 4 Day



Name: _____ DOB: _____

Phone #: _____ Email: _____

Day/Date: TDD Basal: TDD Bolus	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
IOB																						
Total Bolus																						
Set Change																						
Exercise																						
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Ketones, Low BG Treatments, etc.)																						

Day/Date: TDD Basal: TDD Bolus	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
IOB																						
Total Bolus																						
Set Change																						
Exercise																						
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Ketones, Low BG Treatments, etc.)																						

Day/Date: TDD Basal: TDD Bolus	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
IOB																						
Total Bolus																						
Set Change																						
Exercise																						
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Ketones, Low BG Treatments, etc.)																						

Day/Date: TDD Basal: TDD Bolus	12A		3A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
BG																						
Carb Grams																						
Carb Bolus																						
BG Bolus																						
IOB																						
Total Bolus																						
Set Change																						
Exercise																						
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Ketones, Low BG Treatments, etc.)																						

Insulin Pump Flowsheet: 2 Day



Name: _____ DOB: _____
 Phone #: _____ Email: _____

Day/Date:	12A	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
TDD Basal:																									
TDD Bolus:																									
BG																									
Carb Grams																									
Carb Bolus																									
BG Bolus																									
IOB																									
Total Bolus																									
Set Change																									
Basal Rate																									
Temp Basal Rate																									
Exercise																									
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Low BG Treatments, etc.)																									

Day/Date:	12A	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P	
TDD Basal:																									
TDD Bolus:																									
BG																									
Carb Grams																									
Carb Bolus																									
BG Bolus																									
IOB																									
Total Bolus																									
Set Change																									
Basal Rate																									
Temp Basal Rate																									
Exercise																									
NOTES: (Include changes in I:C, ISF, Target BG, Use of Temp Basal, Combo Bolus, Food, IOB, Illness, Stress, Alarms, Low BG Treatments, etc.)																									

Appendix 6:

Diabetes Resource List

Books

- Diabetes Burnout: Preventing It, Surviving It, Finding Inner Peace by William H. Polonsky
- Pumping Insulin: Everything You Need for Success with an Insulin Pump by John Walsh, Ruth Roberts M.A.
- Smart Pumping: A Practical Approach to the Insulin Pump by Howard Wolpert
- Insulin Pump Therapy Demystified: An Essential Guide for Everyone Pumping Insulin (Marlowe Diabetes Library) by Gabrielle Kaplan-Mayer
- The CalorieKing® Calorie, Fat and Carbohydrate Counter by Allan Borushek; Family Health Publications
- The Diabetes Carbohydrate and Fat Gram Guide by Lee Holzmeister; American Diabetes Association®
- Complete Guide to Diabetes, 4th Edition, American Diabetes Association®

Websites

Below is a list of selected internet resources which you may find useful. Animas does not control the content of these sites and is not responsible for information provided. Always consult your HCP for information specific to your needs.

- Children with Diabetes: www.childrenwithdiabetes.com
- Diabetes Juvenil: www.diabetesjuvenil.com
- Juvenile Diabetes Research Foundation International (JDRF): www.jdrf.org
- Downloadable book for children on pumps: www.grandmasandy.com
- Kids R Pumping: www.kidsrpumping.com

Insulin Pumps

- www.animas.com
- www.childrenwithdiabetes.com
- www.insulin-pumpers.org

Exercise

- Diabetes Exercise and Sports Association (DESA): www.diabetes-exercise.org

General Diabetes

- Fact sheets, stats, publications, and information about state diabetes prevention and control: www.cdc.gov/diabetes
- American Diabetes Association (ADA): www.diabetes.org
- Diabetes UK: <http://www.diabetes.org.uk/>
- The Global Diabetes Community: <http://www.diabetes.co.uk/>
- Publishes "Managing Your Diabetes: Basics and Beyond": www.diabetesaction.org
- The Diabetes Mall - books, food scales, information: www.diabetesnet.com
- Information, education, and support for people with diabetes: <http://www.diabetesmonitor.com/>
- Diabetes information, educational, and referral resource: www.diabetes.niddk.nih.gov
- A community of people touched by diabetes, run by the Diabetes Hands Foundation: www.tudiabetes.org/
- Helping the Student with Diabetes Succeed: A Guide for School Personnel: http://ndep.nih.gov/diabetes/pubs/youth_schoolguide.pdf

Nutrition

- www.calorieking.com
- http://diabetes.niddk.nih.gov/dm/pubs/eating_ez/

Continuous Glucose Monitoring

- Dexcom company website: www.Dexcom.com*
- National Diabetes Information Clearinghouse: <http://diabetes.niddk.nih.gov/dm/pubs/glucosemonitor/index.htm>

Medic Alert Jewelry

- www.laurenshope.com
- www.n-styleid.com
- <http://lifetag-alert.com>
- <http://www.medicalert.org>
- <http://www.stickyj.com/medical-emergency.html>

Insulin Pump Accessories

- <https://estore.animascorp.com/>
- <https://www.diabetesnet.com/dmall/index.php/pump-accessories-c-45?osCsid=7d4f55d08077f88c15b2b9518f2aa1bc>
- www.insulinpumpfashions.com
- www.pumpwearinc.com
- www.uniaccs.com/

*Note: Dexcom CGM systems are indicated for adults (age 18 and older) with diabetes.

Appendix 7: Cannula fill amounts

After inserting a new infusion set, the empty cannula needs to be filled with insulin. The amount of insulin required varies. Refer to instructions for use for your infusion set for specific instructions. Below are the cannula length and required insulin fill for Animas' most commonly used infusion sets.*

Comfort™	17 mm - fill empty cannula with 0.70 units insulin
Comfort™ Short	13 mm - fill empty cannula with 0.70 units insulin
inset® 30	13 mm - fill empty cannula with 0.70 units insulin
inset®	6 mm – fill empty cannula with 0.30 units insulin 9 mm – fill empty cannula with 0.50 units insulin
Other	Fill empty cannula with _____ units insulin

- Remember to only fill cannula when you insert a new infusion set.
- For a review of how to insert the infusion set, please go to: www.infusion-set.com
- For all infusion sets, consult the package insert and manufacturer's instructions

* This information is provided for reference only. Always refer to the Instructions for Use provided with the infusion set to verify cannula fill requirements.

Answers to Test Your Knowledge Questions:

Page 6

1. True
2. Basal
3. 3-5 hours
4. Bolus
5. 4

Page 8

1. True
2. Exercise (or increased/decreased activity) and sick days

Page 11

1. b
2. a

Page 12

BG = 115 mg/dL

Step One: $56 \div 12 = 4.70$ units for carbohydrate bolus

Step Two: BG is within target. No BG bolus needed.

Step Three: No need to do this. BG is within target.

Answer: I need to bolus 4.70 units for lunch.

BG = 202 mg/dL

Step One: $56 \div 12 = 4.70$ units for carbohydrate bolus

Step Two: $202 - 100 = 102$, $102 \div 60 = 1.70$ units for BG bolus

Step Three: $4.7 + 1.7 = 6.40$ units

Answer: I need to bolus 6.40 units for lunch.

BG = 70 mg/dL

Step One: $56 \div 12 = 4.70$ units for carbohydrate bolus

Step Two: $70 - 100 = -30$, $-30 \div 60 = -0.50$ units for BG bolus

Step Three: $4.70 - 0.5 = 4.20$ units.

Answer: I need to bolus 4.20 units for lunch.

Page 24

1. 1 to 1½ hours
2. 15

3. True
4. True
5. 57-60 grams
6. True

Page 26

1. Every 2-3 days, or as directed by your HCP and/or diabetes educator
2. True
3. Stomach/abdomen

Page 33

1. I don't take any intermediate or long-acting insulin.
2. By a syringe
3. Take insulin by syringe, change infusion set/site, drink calorie free beverages, continue to monitor BG

Page 35

1. ½ cup of apple juice, 4 glucose tablets
2. 15, 15
3. True
4. False

Page 38

1. False
2. Every 2-4 hours

Page 41

1. True
2. Eat a snack; decrease insulin
3. False

Page 51

1. 12
2. True
3. 4-5 hours
4. False
5. low-fat meal, easy to figure carb amount

Page 66

1. False
2. Every 2-4 hours



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Email: comments@animas.com
www.animas.com