My insulin pump workbook.
Welcome to insulin pump therapy and to the Animas family!

At Animas UK & Ireland, 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® pump.

In addition to this workbook, you will have support from your healthcare professional team (which could include your Consultant, Diabetes Nurse Specialist and Dietitian, and your Animas Territory Manager and/or your Animas Pump Trainer.

If you have any questions, call Animas UK & Ireland on 0800 055 6606 (UK) or 1800 812 715 (Ireland) and we’ll provide you with the name and telephone number of your local Animas contact.

Good Luck!

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® Pump Pointer - 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 own personal goals.

You have probably heard a lot about pump therapy from your Consultant, Diabetes Specialist Nurse, 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 tick mark next to 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 been accepted for 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 ticked numbers 1, 3, 7 and 10, you have reasonable expectations of pump therapy. If you ticked numbers 2, 4, 5, 6, 8 and 9, you should have further discussions with your Consultant, Diabetes Specialist Nurse, Animas Territory Manager and/or Pump Trainer before getting started.

It is a good idea to review your concerns and/or questions with your Consultant, Diabetes Specialist Nurse, Animas Territory Manager and/or Pump Trainer so they can provide proper support.

To Do Now:

List:

Two goals I hope to achieve by pumping:

Any concerns about starting on a pump:

General questions about pump therapy:
Pre-pump topics

The most successful pumpers have a good understanding of pump therapy before they start pumping! This section includes a brief overview of important topics to help your pump training 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 theory of basal/bolus insulin therapy
- Insulin action: onset, peak and duration
- Carbohydrate counting
- Self-monitoring of blood glucose (SMBG): how often and when
- 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 Specialist Nurse, Animas Territory 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 this page. Put a tick mark in front of the topics you are familiar with.

Make sure you discuss this list with your Diabetes Specialist Nurse and/or Pump Trainer before you begin pump therapy.
Pump therapy overview

Insulin pumps are devices which are about the size of a mobile 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 to the infusion set. To meet the individual needs and preferences of pumpers, infusion sets come in variety of cannula and tubing lengths.

Pumps use only short or rapid-acting insulin. The most common types of insulin used in pumps are rapid-acting: NovoRapid®, Humalog® and Apidra®.

Rapid-acting insulin:
- Starts working almost immediately after it is injected.
- Peaks (or works its hardest) about 1 to 1½ 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 in two ways:

**Basal insulin:** the small amount of insulin delivered continually and automatically throughout the day and night. This is called your Basal Rate(s).

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

**Basal Insulin**

Your body needs a small amount of insulin continually throughout the day. When on a pump, basal insulin takes the place of long-acting insulin. When set correctly, your basal rates should maintain fairly even BG levels between meals and overnight. This is what a healthy pancreas does.

Initially your healthcare professional 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 accommodate these changing needs. Your Animas® insulin pump can be programmed to deliver up to 12 basal rates per day.

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

NovoRapid® is a registered trademark of Novo Nordisk A/S. Humalog® is a registered trademark of Eli Lilly and company. Apidra® is a registered trademark of Sanofi-Aventis.
Bolus Insulin
You will need to bolus when you eat carbohydrates (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 on your Animas® pump 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 on your Animas® pump 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 6 - 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 with your healthcare professional, which may take several weeks to months, you will find that being on a pump helps you maintain tighter control and give you more flexibility with managing your diabetes.

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

**Typical Routines on Injections:**
- Multiple daily injections
- Scheduled meals/snacks
- Planned exercise
- Frequent BG testing as directed by your health care professional

**Typical Routines on a pump:**
- 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
- Frequent BG testing as directed by your health care professional

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, carbohydrate intake, exercise, sick days, etc.
- Communicate regularly with your health care professional
Introduction to Pumping

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 21. When new to pumping, you may be asked by your healthcare professional 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.

Basal rate details

Your insulin pump automatically releases small amounts of insulin every few minutes. This is called a basal rate. The basal rate is adjusted to keep the BG level steady between meals and during sleep, as well as assisting other important body functions, such as compensating for fluctuations in hormone levels. Basal insulin is often referred to as background insulin.

Even though the pump delivers basal insulin every few minutes, the basal rate is always stated as an hourly rate - in other words, the total amount you get over one hour. 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.) When you first start on the pump, you may only have one basal rate throughout the day.

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 decide to change it. (See Fine Tuning Basal Rates on page 33.)

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”.
Using different basal programs is an advanced feature and will be covered in greater detail in the section on Advanced Pumping, page 42. For now, we just 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 42).

<table>
<thead>
<tr>
<th>Basal Rates Summarised:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A Basal Program is a 24 hour set of basal rates.</td>
</tr>
<tr>
<td>• 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.)</td>
</tr>
<tr>
<td>• You can customise 4 different basal programs.</td>
</tr>
<tr>
<td>• Only one Basal Program can be active (or running) at a time.</td>
</tr>
<tr>
<td>• A Temporary Basal Rate will override the active Basal Program for a chosen amount of time.</td>
</tr>
</tbody>
</table>

**What is my Basal Rate?**
Your healthcare professional 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 adjusting or fine-tuning once you start pumping.

🔍 **Test Your Knowledge**

1. Basal insulin is the small amount of insulin my body needs throughout the day, even when I don’t eat.
   - True [ ]
   - False [ ]

2. Listed are two activities or situations when I might want to use the temporary basal rate feature:

---

**Bolus dose details**
You need to calculate a bolus dose of insulin for when you eat or to correct a high BG. In general, there are two types of boluses: Carbohydrate Boluses and Blood Glucose Boluses (correction boluses). We briefly discussed this in Pump Therapy Overview. Review the box 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 (Insulin on Board)
- Recent or planned activity

**Carbohydrate Bolus**

To calculate the amount of insulin for when you eat, you will need to know your Insulin-to-Carbohydrate 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 you use to calculate carbohydrate boluses:

\[
\text{Carbohydrate grams} = \frac{\text{No. of units to bolus}}{\text{My I:C}}
\]

**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 13 for help with this.

**Blood Glucose Bolus (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 = 2.8 mmol/L, then you should expect a bolus of one unit to lower your BG about 2.8 mmol/L.

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 may be 6.0 mmol/L. However, when you are new to pumping, or if you don’t recognize 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 7 – 8.0 mmol/L. Also, if your glucose control before starting pump therapy is in a higher range, your healthcare professional may advise higher targets with the goal of gradually improving your control.
It is common to have a target BG range, not just a single number. For example, if your target range is 5 – 7.0 mmol/L, you do not have to do a BG bolus unless your BG is higher than 7.0 mmol/L. To keep the maths simple, find the number in the middle of your target blood glucose range and use this in your bolus dose calculations. So, if your target range is 5 – 7.0 mmol/L, you would use 6.0 mmol/L 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 could be 8 – 10 mmol/L.

Some healthcare professionals 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 health care professional for your individual target goals!

Calculating a BG Bolus
Here is the formula to calculate a BG Bolus:

$$\frac{\text{Current BG} - \text{Target BG}}{\text{ISF}} = \text{No. units for BG Bolus}$$

**Sample BG Bolus Calculation: BG is above target:**

If your ISF is 2.8 mmol/L and your target BG is 6.0 mmol/L, how much would you bolus if your BG is 13.9 mmol/L?

$$\frac{13.9 \text{ mmol/L} (BG) - 6.0 \text{ mmol/L} (target BG)}{2.8 \text{ mmol/L} (ISF)} = 2.8 \text{ units of insulin to lower BG by 7.9 mmol/L}$$

With both the carbohydrate and BG bolus, there are other details to consider before calculating your bolus. An advanced pumping feature, called Insulin on Board, can help you adjust your boluses based on the insulin still working in your body from recent boluses. See the section Insulin on Board on page 43.

💡 Your healthcare professional 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 ISF’s 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 take a BG bolus before bedtime. Perhaps your usual ISF of 2.5 mmol/L works well in the daytime, but at night it always causes a low BG. In this case, using an ISF of 2.5 mmol/L in the daytime and an ISF of 2.8 mmol/L at bedtime might be the solution.

See the section on Fine-Tuning Bolus Dose Ratios pages 38 - 41.

**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 carbohydrate 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 2.8 mmol/L and your target BG is 6.0 mmol/L, how much is your BG bolus if your BG is 4.5 mmol/L?

\[
4.5 \text{ mmol/L (BG)} - 6.0 \text{ mmol/L (target BG)} = -1.5 \text{ mmol/L (lower than target)}
\]

\[
-1.5 \text{ mmol/L (lower than target)} \div 2.8 \text{ mmol/L (ISF)} = -0.50 \text{ units}
\]

In the above example, you would subtract 0.50 units from your carbohydrate bolus to get your bolus total. For example, if your carbohydrate bolus was 4.50 units, you would only bolus 4.00 units (4.50 minus 0.50). If you were not planning to eat a meal, you should consume some carbohydrate that will act quickly (i.e., glucose tablets) to treat the low BG. See the section Low Blood Glucose, “The Rule of 15” on page 24 for more information.

Sometimes, it may be easier to treat the low BG with carbohydrates as you normally would, rather than calculating a negative correction. In other words, eat or drink 15 grams of fast-acting carbohydrate right away! In this case you would then just take your usual carbohydrate bolus for the meal. Do not add the carbs you used to treat the low BG.

**Putting It Together**

After reviewing this information, you may need to use just one of these bolus formulas, or you may need to consider them together. 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 Insulin on Board on page 43.
- 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**

One: If you are about to eat a meal or snack, determine how much carbohydrate you will be eating and use your I:C to calculate a bolus.

Two: 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.

Three: 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 do the three examples below: Carbs consumed: 56 grams

- I:C is 1:12
- ISF is 3.3 mmol/L
- Target range is between 5 – 7.0 mmol/L and your Target BG is 6.0 mmol/L
- BG = 6.4 mmol/L
- BG = 11.2 mmol/L
- BG = 4.0 mmol/L

Always check with your healthcare professional 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 that you will need to take.

<table>
<thead>
<tr>
<th>My I:C</th>
<th>My ISF</th>
<th>My Target BG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Sample I:C 1:15; ISF 2.8 mmol/L; Target BG 6.0 mmol/L; Actual BG 13.9 mmol/L)

<table>
<thead>
<tr>
<th>Time</th>
<th>Qty</th>
<th>Food/Drink</th>
<th>Carb grams</th>
<th>Time</th>
<th>Qty</th>
<th>Food/Drink</th>
<th>Carb grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>75g</td>
<td></td>
<td>Chicken</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 tbsp</td>
<td></td>
<td>Mashed potatoes</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Asparagus spears</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Small roll</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 tsp</td>
<td></td>
<td>Butter</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Pear</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Carb 70g

Bolus Calculation
Carb bolus (70 ÷ 15) 4.7u
Correction bolus (13.9-6.0) ÷ 2.8 +2.8 u
TOTAL BOLUS 7.5 u

What is my I:C Ratio and ISF?
Your healthcare professional 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 Carbohydrates

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 blood glucose the most and the fastest. In fact, almost all of the carbohydrates we eat, no matter what type of carb, will end up as glucose in our bloodstream within approximately 1 to 1½ hours. Many foods such as breads, cereals, rice, pasta, fruits, milk, yogurt, starchy vegetables, and sweets (cakes, pies, sweets, cookies, regular fizzy drinks, etc.) contain carbohydrate.

Some carbohydrates such as those found in juice or regular fizzy drinks can enter your bloodstream very quickly, while others that are higher in fibre, such as those found in wholemeal bread, or baked beans tend to enter the blood stream more slowly.

Once the carbohydrate from your meal has been converted to glucose and absorbed into your bloodstream, insulin will be 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 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 blood glucose 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 healthcare professional.

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

Monitoring or “counting” how many grams of carbohydrate 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 carbohydrate that you eat. Keep in mind, you do not need to avoid carbohydrate containing foods, you simply need to balance them with your medication and activity level.
**Carbohydrate counting methods**

There are two common methods for counting carbohydrates:

1. Carbohydrate Portions (CP’s)
2. Carbohydrate gram counting

The following table provides examples of Carbohydrate Portions:

<table>
<thead>
<tr>
<th>Food or Beverage Item</th>
<th>Serving size that will provide about 15 grams of carbs or 1.5 Carbohydrate Portions (CP’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grains, Beans, Starchy Vegetables</strong></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>1 slice</td>
</tr>
<tr>
<td>Bread roll</td>
<td>½ large</td>
</tr>
<tr>
<td>Bran Cereal</td>
<td>Small portion (30g)</td>
</tr>
<tr>
<td>Cream crackers</td>
<td>3</td>
</tr>
<tr>
<td>Pasta</td>
<td>1½ tablespoons cooked</td>
</tr>
<tr>
<td>Rice</td>
<td>1½ tablespoons cooked</td>
</tr>
<tr>
<td>Beans, Lentils, Peas, Sweetcorn</td>
<td>2 tablespoons</td>
</tr>
<tr>
<td>Potato</td>
<td>1 small roast, 2 small boiled, 2 tablespoons</td>
</tr>
<tr>
<td>mashed</td>
<td></td>
</tr>
<tr>
<td><strong>Fruit</strong></td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>1 medium</td>
</tr>
<tr>
<td>Strawberries, fresh/whole</td>
<td>15</td>
</tr>
<tr>
<td>Fruit Juice</td>
<td>Small glass (150ml)</td>
</tr>
<tr>
<td><strong>Milk and Yogurt</strong></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>300ml</td>
</tr>
<tr>
<td>Yogurt, Plain</td>
<td>160g</td>
</tr>
<tr>
<td><strong>Desserts /Sweets</strong></td>
<td></td>
</tr>
<tr>
<td>Ice Cream</td>
<td>1 scoop</td>
</tr>
<tr>
<td>Jam</td>
<td>2 teaspoons (20g)</td>
</tr>
<tr>
<td>Cake or Brownie</td>
<td>2 inch square</td>
</tr>
</tbody>
</table>
Carbohydrate Portions
Carbohydrate Portions (CP’s) are lists of food that, when eaten in the specific serving size, provides about 10 grams of carbohydrates. These lists are based on averages, so that is why it is more accurate to count the actual grams of carbohydrate in the food item you are eating.

Carbohydrate Gram Counting
It’s easy to get the exact carbohydrate content of your favourite foods. You might consider purchasing a food composition book or download a smart phone app. You may also find many of your favourite 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 supermarket.

Using Food Labels to Count Carbohydrate
Follow these steps to count carbs using a food label:

1. Look for grams of Total Carbohydrate in each serving (includes all types of carbs e.g. sugars, fibre and complex carbs).
2. Measure or weigh what you will be eating and compare it to a serving size and adjust the carbohydrate grams to reflect the amount of the food item that you actually eat.
3. If there are more than 5 grams of fibre listed, then half of the fibre grams should be subtracted from the total carbohydrate amount.

Carbohydrate counting tools
It is important to remember that carbohydrate counting is only accurate when you pay attention to serving sizes. Measuring utensils and weighing scales 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.

Counting carbohydrates is 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 favourite foods memorized in no time. The following carbohydrate counting tools can help you to develop your carb counting skills.

**Carb Counting Tools**
- Nutrition Labels
- Measuring spoons
- Weighing scales
- Calculator
- Reference books e.g. Collins Gem Carb Counter, Carbs and Cals
**Protein and Fat**

Protein and fat can affect blood glucose 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 in Section 4 for more information on extended and combination boluses.

**Alcohol**

Alcohol by itself does not contain carbs. Beer and many drinks that contain alcohol do have carbs. In general, alcohol can lower blood glucose and therefore you should always consume alcohol with a meal or snack. Discuss your specific questions or concerns about adjusting insulin for alcohol ingestion with your healthcare professional.

**Glycaemic Index (GI)**

The glycaemic index ranks carbohydrate-containing foods in terms of how they affect your blood glucose levels two to three hours after you eat. To keep carb counting practical and simple, you still count all carbs the same way. Some foods may have a bigger impact on your after-meal glucose levels than other foods, even if the carb amounts are the same. There are many factors involved in the glycaemic index and these factors can affect individuals differently. Some carbs are digested slower than others. Keep good records of foods eaten, insulin doses taken, and your resulting blood glucose levels to learn which foods may need special attention when you are taking your insulin. 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 to deal with these types of foods.

**Summary**

As was mentioned before, counting the actual amount of carbohydrate in your meals and snacks is a great method to help you determine the ideal amount of insulin that you will need to take, or to help you with making sure that you do not eat more carbohydrate than a fixed dose of medication will be able to take care of. By keeping careful records and working closely with your healthcare professional, you will likely find that over time, with a little practice and persistence, you can work in your favourite foods and meals without hurting your overall BG control.

**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 Carbohydrate Portion (CP) will have _______ grams of carbohydrate.
3. Fat can delay the digestion process and lead to higher BG levels many hours after eating a meal.  
   True √ False □
4. The following meal has about _______ grams of carbs.  
   Chicken sandwich, 1 apple, 1 glass (250 ml) of skimmed milk
   True □ False √
5. 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, the day is arriving when you will wear your pump with insulin! 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 to have them answered before you begin pumping.

This section will provide you with important details relating to starting on your pump with insulin.

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
- Record keeping
- Wearing the Pump

Infusion site selection and care

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

Selecting Sites

Insulin is absorbed and used best from the stomach area. It is the most common area recommended by healthcare professionals for infusion set placement. Other popular sites are the hip and upper buttocks area (beneath your belt area).

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 partially dislodged. It is also recommended to insert the infusion set at least two inches away from the bellybutton and to avoid areas with lipohypertrophy, scars, tattoos and moles.

Caring for Sites

Infusion site infections are potential problems for pumpers. By taking proper care, you can greatly minimize your risk. This means preparing your skin properly before inserting an infusion set, changing your infusion set as directed by your healthcare professional and quickly caring for any problems that arise. See below for an overview and see Appendix 2 for more details.
**Caring for Infusion Sites:**

- Always wash your hands before changing your infusion set.
- Change your infusion set every two to three days or as directed by your healthcare professional.
- 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. Changing an infusion set after bathing helps to ensure the insertion area is clean.
- 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 healthcare professional 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 odour.

**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

1. Date: ____________________ Time: ____________________ Location: ____________________

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 ________ (time) the night before your pump start appointment or check with your healthcare professional for specific instructions.

3. The morning of your pump start appointment:
   Take your short or rapid-acting insulin (Regular/Humalog®/NovoRapid®/Apidra®) for your food and any high BG. Check with your healthcare professional 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 carbohydrates with short or rapid-acting insulin that your healthcare professional has prescribed.

5. Bring these items with you the day of your pump start:
   • One unopened vial of Humalog®, NovoRapid® or Apidra® insulin
   • BG meter, lancets and test strips
   • BG logs
   • Glucose tablets or another treatment for hypoglycemia

6. Other items you need:
   • Ketone test strips
   • Carbohydrate counting book
   • Glucagon emergency kit

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

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Pump start doses

• Basal Rate: My starting basal rate is ________ units per hour.

Other:

Carb Boluses
Use the Insulin-to-Carbohydrate ratio (I:C) 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:
\[
\text{Carbohydrate grams} \div \text{My I:C ratio} = \text{No of units to bolus}
\]

<table>
<thead>
<tr>
<th>Daily Time Slot</th>
<th>My I:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>12am</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

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 ________ mmol/L

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>My ISF</th>
</tr>
</thead>
<tbody>
<tr>
<td>12am</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
</tbody>
</table>

BG Target
My target BG is ________ mmol/L with a target range of +/- ________ mmol/L

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>My BG Target</th>
<th>My BG Target Range (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12am</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Formula for High BG corrections:
\[
\text{Current BG} \div \text{Target BG} = \text{No units needed to return BG to target ISF}
\]
Troubleshooting high blood glucose (hyperglycaemia)

When pumping, high BG must be taken seriously as insulin pumps deliver only short or 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 get 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 the fat being broken down.
- Ketones (acids) build up in the blood and urine when you don’t have enough insulin. Urine ketones can be checked with a visual test strip and ketones in the blood can be detected more quickly than urine using a specific blood ketone testing system and strips. Ask your healthcare professional when and how to test for ketones.
- 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.
- If ketone strips detects moderate to large ketones and you have an elevated BG, you should 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 are likely to need extra insulin to correct high BG when ketones are present. Contact your healthcare professional 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 odour to breath, rapid or difficulty breathing. DKA can lead to dehydration electrolyte imbalance, diabetic coma or even death.

DKA is serious and scary, but it can be prevented! Check your BG regularly (at least 4 times a day or as directed by your healthcare professional) and follow the tips below to be prepared.

- Always carry a syringe and vial of insulin or an insulin pen as part of your back up plan.
- Follow the “Action Plan for High BG” on page 23 for high BG.
- Read through the questions 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 23.

• Call your healthcare professional 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 Accident and Emergency Department or call 999.

High BG…. Questions to help you troubleshoot

**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 site?

**CAUTION!**

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

**The Insulin Pump**

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

**The Insulin**

- Is your insulin expired/inactive?
- Is it cloudy or clumped?
- How long has your insulin been at room temperature?
- Did you leave your insulin in a warm location?
- 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 13.9 mmol/L 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 or pen and changing your infusion set.

- If you cannot find a logical cause for the high BG, check for ketones.

### Negative to Small Ketones
- Give a BG bolus through your pump.
- Recheck BG in 2 hours.

### Moderate to Large Ketones
- Take your BG bolus by syringe or pen immediately. You will likely need more insulin than usual for your correction.
- Change your infusion set.
- Begin to drink plenty of beverages that are calorie-free; aim for 1 glass every ½ hour.
- Recheck BG in 2 hours.

If BG is decreasing, that is a good sign, but monitor your BG more closely throughout the day.

If BG is NOT decreasing, take another correction by syringe or pen.
- Change your infusion set.
- Continue to monitor to be sure your BG decreases.

If BG is decreasing, you must continue to monitor your BG to be sure the new infusion set is working.

If BG is NOT decreasing,
- If ketones are still moderate to large call your HCP.
- If ketones are decreasing, take another BG correction as directed by your HCP and continue to monitor closely.

For two unexplained BG levels over 13.9 mmol/L ALWAYS:
- Check for ketones
- Take your BG bolus by syringe or pen
- Change your infusion set

Test Your Knowledge
1. Why is an insulin pump wearer at a higher risk of developing DKA?
2. How should I give a correction bolus if I have moderate to large ketones?
3. Listed are four steps I should take immediately if I have moderate to large ketones:
Low blood glucose (hypoglycaemia)

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 should expect to experience some low BG reactions as you work to improve your overall glucose control. For example, a BG of 5.5 mmol/L may feel like 2.2 mmol/L if you consistently experience BG levels in the 17’s range. Also, the risk for low BG increases with improved BG control. However, studies support that the benefits of improved glucose control outweigh the risks of low BG.

In general, the main events that cause low BG 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 for adults 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 carbohydrate since this will quickly raise your BG. Foods like chocolate will not work as fast because of the fat they also contain.

Recommended treatments include:
(Each suggestion is 15 grams of carbohydrate)

- Glucose tablets, 4-5 tablets (depends on brand)
- Lucozade 80ml
- Fruit juice 150ml
- Hypofit® 18g sachet
- GlucoJuice™ 60ml
- Glucogel™ 25g (=10g carbs)

“The Rule of 15”

- Eat or drink 15 grams of carbohydrate
- Wait 15 minutes
- Recheck your BG
- If your BG is less than 4.0 mmol/L, repeat above steps

Treatment of hypoglycaemia for children may be different to that of adults. Please contact your healthcare professional for advice.

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

It is always a good idea to try to determine the cause of your low BG so you can try to prevent it the next time. Questions a pump wearer should ask include:

- Is my basal rate too high? (especially if you are having frequent low BGs)
- Are my basal rates programmed correctly?
- Is the time on my pump set correctly? Verify that AM / PM are not inadvertently switched.
- Do I need an adjustment to my bolus ratios (I:C or ISF) ?
- Are my BG targets too low?
- Am I estimating my carbohydrates correctly?
- Am I calculating correctly to determine my bolus doses?
- Am I taking BG boluses too soon? Are my bolus doses overlapping?

Talk to your healthcare professional if you need help answering these questions or determining a cause for your low BG. Also, always feel free to contact Animas Customer Support on 0800 055 6606 (UK) or 1800 812 715 (Ireland) 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 in the bloodstream. It is recommended that everyone who takes insulin has 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, then injected into a large muscle. Glucagon is used if you are unconscious or having a seizure and unable to safely swallow food or liquid. Family members and/or a friend should know where you keep your glucagon and be trained in how and when to use it. Talk to your healthcare professional about getting a glucagon kit if you do not have one already. Make sure you check the expiration date and replace it as needed. Also, some people need a glucagon kit in more than one place, including home, school and work.

Test Your Knowledge

1. List two good examples of foods/drinks to treat low BG.

2. When my BG is low, I should eat/drink _______ grams of carbohydrate, and 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 healthcare professional, 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 dose of insulin, carbohydrate 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 pre-arranged with your healthcare professional.
- You may need to temporarily increase or decrease your basal rate(s). Check with your healthcare professional for specific guidelines. See page 47 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 13.9 mmol/L or as directed by your healthcare professional.
- Ketone testing will guide you in determining BG bolus doses and the method of delivery (pump versus syringe or pen). See the Action Plan for high BG on page 23.

When to Call your Healthcare Professional*
- Illness continues without improvement for more than 24 to 48 hours.
- Vomiting or diarrhoea continues longer than 4 hours.
- Moderate to large ketones in the blood or urine.
- Your BG levels are less than 4.0 mmol/L or above 13.9 mmol/L and not responding to usual corrective action.
- You have signs of ketoacidosis, dehydration or other serious problems, such as increased drowsiness, abdominal or chest pain, difficulty breathing, fruity odour 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 healthcare professional's recommendations.

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 realise 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 healthcare professional 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 healthcare professional 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 compensate. 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 often 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 healthcare professional 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 21.

💡 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.
Starting on Insulin

General Exercise Tips
Follow these suggested guidelines when activity is increased:

• Before you begin exercising with an insulin pump, talk to your healthcare professional to get help on adjusting your insulin doses. If your BG is 13.9 mmol/L or greater prior to exercise, check to see if you have ketones. If ketones are present, refer to the guidelines listed on page 23. Exercise under the guidance of your healthcare professional.

• 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 carbohydrates to treat low BG.

• Drink plenty of water to stay properly hydrated.

Insulin Adjustment Tips
These are just some general tips to consider. Remember to consult your own healthcare professional for specific guidelines.

• In general, exercise lasting longer than 30 minutes will require extra carbohydrates 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 42.

• You may find adjusting both basal and bolus insulin is best for you.

• When possible, set your temporary basal rate half to one hour 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 healthcare professional or contact Animas® Customer Support on 0800 055 6606 (UK) or 1800 812 715 (Ireland) 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.

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 healthcare professional 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 healthcare professional 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 carbohydrates, and whether the meal was cooked at home or at a restaurant
• bolus doses (carbohydrate 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 levels 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.
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 healthcare professional 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 healthcare professional. 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 trousers, 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 trouser 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.
- For contact sports, it is best to disconnect your pump. See the section on Physical Activity on page 27.

**Sleeping:**
- Place the pump near or under your pillow. Some people keep the pump on their bedside table, which may require longer length tubing.
- Clip the pump to your pyjamas or put it in a pocket.
Swimming:
• Animas® pumps are waterproof for 24 hours in 12 feet / 3.6 metres 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 on 0800 055 6606 (UK) or 1800 812 715 (Ireland) 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.

Insuring your pump:
We strongly recommend insuring your pump on your house contents insurance for peace of mind should accidental damage to the pump occur. Please contact us on 0800 055 6606 (UK) or 1800 812 715 (Ireland) for current value of pump.
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 healthcare professional 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 healthcare professional. 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 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 time frames 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.
Blood Glucose:
• Generally, your BG should be in a reasonable range at the beginning of an evaluation.

A BG in the 5 – 8.5 mmol/L range is reasonable, but check with your healthcare professional 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 healthcare professional.

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

<table>
<thead>
<tr>
<th>Evaluation Time frames and directions</th>
<th>When to check BG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overnight:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Eat an early evening meal and take your usual meal bolus.</td>
<td>4 hours after evening meal</td>
</tr>
<tr>
<td>2. Eat a predictable meal with a known number of carbohydrate grams.</td>
<td>Bedtime</td>
</tr>
<tr>
<td>3. Choose a low-fat meal.</td>
<td>Midnight</td>
</tr>
<tr>
<td>4. Do not eat after your evening meal.</td>
<td>2-3 am</td>
</tr>
<tr>
<td>5. Begin the evaluation about 4 hours after evening meal if your BG is in a reasonable range.</td>
<td>Upon waking</td>
</tr>
<tr>
<td><strong>Morning evaluation:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Begin the evaluation if your BG is in a reasonable range.</td>
<td>Every 1-2 hours upon waking until lunch</td>
</tr>
<tr>
<td>2. Skip breakfast.</td>
<td></td>
</tr>
<tr>
<td>3. Do not eat or drink until lunch.</td>
<td></td>
</tr>
<tr>
<td><strong>Afternoon evaluation:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Begin the evaluation if your BG is in a reasonable range 4 hours after breakfast.</td>
<td>4 hours after breakfast</td>
</tr>
<tr>
<td>2. Skip lunch.</td>
<td>Every 1-2 hours until evening meal</td>
</tr>
<tr>
<td>3. Do not eat or drink until evening meal.</td>
<td></td>
</tr>
<tr>
<td><strong>Evening evaluation:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Begin the evaluation if your BG is in a reasonable range 4 hours after lunch.</td>
<td>4 hours after lunch</td>
</tr>
<tr>
<td>2. Skip evening meal.</td>
<td>Every 1-2 hours until bedtime</td>
</tr>
<tr>
<td>3. End the evaluation at bedtime and have a snack if desired (bolus as usual for your snack).</td>
<td></td>
</tr>
</tbody>
</table>
**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 _____ mmol/L and _____ mmol/L.

**Overnight:**

<table>
<thead>
<tr>
<th>Evening meal carb/evening meal bolus</th>
<th>Time</th>
<th>4 hours after evening meal</th>
<th>Bedtime</th>
<th>12am</th>
<th>3am</th>
<th>Upon waking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Morning:**

<table>
<thead>
<tr>
<th>Bedtime carb/bedtime bolus</th>
<th>Time</th>
<th>Upon waking</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>BG day 2</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Afternoon:**

<table>
<thead>
<tr>
<th>Breakfast carb/breakfast bolus</th>
<th>Time</th>
<th>4 hours after breakfast</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evening:**

<table>
<thead>
<tr>
<th>Lunch carb/lunch bolus</th>
<th>Time</th>
<th>4 hours after lunch</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG day 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 co-operating.” 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 healthcare professional.

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.

Example of Basal Evaluation Log:

### Afternoon:

<table>
<thead>
<tr>
<th>Breakfast carb/ breakfast bolus</th>
<th>Time</th>
<th>4 hours after breakfast</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>37g/2.45 units</td>
<td>BG day 1</td>
<td>8.3 mmol/L</td>
<td>7.7 mmol/L</td>
<td>6.5 mmol/L</td>
<td>5.5 mmol/L</td>
<td>4.8 mmol/L</td>
</tr>
<tr>
<td>45g/3.00 units</td>
<td>BG day 2</td>
<td>7.5 mmol/L</td>
<td>6.9 mmol/L</td>
<td>5.8 mmol/L</td>
<td>5.0 mmol/L</td>
<td>4.6 mmol/L</td>
</tr>
<tr>
<td>35g/2.35 units</td>
<td>BG day 3</td>
<td>7.0 mmol/L</td>
<td>6.8 mmol/L</td>
<td>5.3 mmol/L</td>
<td>4.7 mmol/L</td>
<td>4.4 mmol/L</td>
</tr>
</tbody>
</table>

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 healthcare professional prior to changing basal rates. You may get to the stage when you and your healthcare professional feel you can make your own basal rate adjustments. The example basal log above indicates a gradual reduction in BG over the evaluation period. A reduction in basal rate would 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 2.0 mmol/L 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 NovoRapid®, Humalog® or Apidra® in the pump. If you use a different type of insulin, check with your healthcare professional for specifics on timing.
- Make one change at a time.
- Re-evaluate 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 re-evaluation 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 42.

---

**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. List two important things to consider for the meal prior to doing a basal rate evaluation.
   
   ________________________________
Evaluating and fine-tuning bolus dose ratios

Your initial bolus ratios (I:C ratios and ISF’s) 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 Insulin-to-Carbohydrate (I:C) Ratio

**Directions**
- Basal rates should be evaluated and adjusted if necessary prior to evaluating your I:C ratio
- BG should be in target range before the 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

**Blood Glucose Checks**
- 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

<table>
<thead>
<tr>
<th>Time</th>
<th>Before Meal</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00am</td>
<td>5.5 mmol/L</td>
<td>8:00am</td>
<td>9:00am</td>
<td>10:00am</td>
<td>11:00am</td>
</tr>
<tr>
<td>8:00am</td>
<td>9.8 mmol/L</td>
<td></td>
<td>12.6 mmol/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00am</td>
<td>12.6 mmol/L</td>
<td></td>
<td></td>
<td>10.5 mmol/L</td>
<td></td>
</tr>
<tr>
<td>10:00am</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.4 mmol/L</td>
</tr>
<tr>
<td>11:00am</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The example above indicates that the bolus for the meal is not enough. The BG rose 7.1 mmol/L 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 carbohydrate. 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 time frame.
Evaluating the Results

- Expect your 2 hour post-meal BG to be 2 – 4.0 mmol/L higher than your before-meal BG.
- If BG returns to target 4 hours after meal, I:C ratio is 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. (e.g. 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. (e.g. if on 1:14, change up to 1:16)

*Check with your healthcare professional for the amount to adjust.*

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.

<table>
<thead>
<tr>
<th>Directions</th>
<th>Blood Glucose Checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal rates should be evaluated and adjusted prior to evaluating your ISF</td>
<td>Check BG prior to taking correction dose</td>
</tr>
<tr>
<td>Start 4 hours after previous bolus and when you can plan to not eat for 4 hours</td>
<td>Check BG hourly for 4 hours</td>
</tr>
<tr>
<td>Start when BG is above target (at least 2 – 3.0 mmol/L)</td>
<td></td>
</tr>
<tr>
<td>If BG is higher than 13.9 mmol/L be sure to troubleshoot high BG before starting evaluation. If you have ketones, postpone evaluation and treat high BG</td>
<td></td>
</tr>
<tr>
<td>Do not evaluate ISF during time of illness, or unusual stress</td>
<td></td>
</tr>
<tr>
<td>Do not evaluate if you have exercised within the past 24 hours, unless this is your usual routine</td>
<td></td>
</tr>
<tr>
<td>Calculate and deliver BG bolus using your ezBG feature</td>
<td></td>
</tr>
<tr>
<td>If BG drops below 3.9 mmol/L during evaluation, stop and treat low</td>
<td></td>
</tr>
<tr>
<td>You may want to evaluate ISF at different times of the day</td>
<td></td>
</tr>
</tbody>
</table>
The First Few Weeks to Months

Example of ISF Bolus Evaluation Log
Day/Date: Tuesday, March 6  Event: Overnight ISF

<table>
<thead>
<tr>
<th>Time</th>
<th>BG before correction dose</th>
<th>Hour 1</th>
<th>Hour 2</th>
<th>Hour 3</th>
<th>Hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00am</td>
<td>12.2 mmol/L</td>
<td>1:00am</td>
<td>2:00am</td>
<td>3:00am</td>
<td>4:00am</td>
</tr>
<tr>
<td>BG</td>
<td>11.1 mmol/L</td>
<td>9.4 mmol/L</td>
<td>8.6 mmol/L</td>
<td>7.8 mmol/L</td>
<td></td>
</tr>
<tr>
<td>ISF/Target</td>
<td>1:2.8 mmol/L</td>
<td>6.5 mmol/L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolus correction</td>
<td>2 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 2.8 mmol/L and your BG remains higher than target, try using an ISF of 2.5 mmol/L.

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 13.9 mmol/L), 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 healthcare professional before changing your I:C’s or ISF’s.
Bolus Dose Evaluation Logs
Use the following charts to help you pull together information from your bolus dose evaluations.

### I:C Ratios

<table>
<thead>
<tr>
<th>Day/Date:</th>
<th>Event:</th>
<th>Before Meal</th>
<th>hour 1</th>
<th>hour 2</th>
<th>hour 3</th>
<th>hour 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbs:</td>
<td></td>
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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 healthcare professional’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
- ezBG
- Insulin On Board
- Extended and Combination (“Combo”) Bolus
- Temporary Basal Rates
- Multiple Basal Programs
- Time off the pump

Always check with your healthcare professional 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 divided by 15 (I:C) = 3.0 units of insulin). This was an easy example... you could probably do the maths in your head! But it won’t always be this easy. The great news is that your insulin pump can do this maths 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 on 0800 055 6606 (UK) or 1800 812 715 (Ireland). 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 healthcare professional 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 carbohydrate 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 ISF’s in Advanced Setup. Enter current BG and your pump will use this information to calculate a recommended BG bolus. If the Insulin on Board (IOB) feature is activated, your pump will calculate a reduced bolus dose for you 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 ISF’s, 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 3.9 mmol/L or above 13.9 mmol/L, 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

**Insulin on Board (IOB)**
Insulin on Board 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 between meals 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 hours 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 healthcare professional 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 carbohydrate 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 in the status screen on your pump. Consider this example to see why this may be useful: It is bedtime and your BG is 5.6 mmol/L. 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.

**Insulin on Board 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 carbohydrate bolus for the banana since you just bolused for lunch 30 minutes ago?

**A:** No! You are eating more carbohydrates 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 carbohydrate 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 fibre foods. Extending a bolus can also help those who have gastroparesis or delayed digestion.

Combo Boluses are often helpful when eating pizza, Chinese, Indian, Mexican, 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 healthcare professional about when you should try this feature and for specific guidelines on how to start using it. Recording BG levels and a food diary 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 healthcare professionals’ recommendations. The following information is intended as a guideline only. Always review the data you obtain with your healthcare professional before making any changes.

Combo Bolusing Guidelines

1. Begin with a 50%/50% split.
   a. 50% Normal Bolus
   b. 50% Extended Bolus over a 2 hour period
Advanced pumping features and topics

Example: Eating at 6 PM
Meal contains: 60 grams carbohydrate (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 good 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 healthcare professional for their specific recommendations. Covering bolus doses is easy; just calculate them as usual and inject insulin by syringe or pen 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.

Be prepared! Talk to your healthcare professional now and keep a written copy of your plan where you will be able to find it should you need it.

💡 Be prepared! Always have a plan to follow in case you want or need to disconnect from your pump for a period of time. Also, always 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 blood glucose 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 mobile 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 blood glucose testing provides a measurement of your blood glucose 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 healthcare professional 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 healthcare professional.

**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 maths formula to convert blood glucose readings to CGM readings.

When calibrating the CGM, be sure to use:

- a blood glucose meter that has been quality checked with control solution
- the same blood glucose 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 blood glucose 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 blood glucose 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 blood glucose meter may not match exactly.
Continuous glucose monitoring

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 provides 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 blood glucose 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 scrambled eggs on toast. Two hours after taking her insulin and eating, her CGM reads 12.0 mmol/L. 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 12.0 mmol/L 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 ezBG 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

Types of Insulin Used in an Insulin Pump:
Rapid Acting
Humalog® (lispro), NovoRapid® (aspart) or Apidra® (glulisine)

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

Onset, Peak and Duration of Insulin: (time is in hours if not specified)
Onset – when it starts working
Peak – when it is working the hardest
Duration – how long it is continuing to work

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<th>Peak</th>
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<td>15 min.</td>
<td>30-90 min.</td>
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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 has expired or appears discoloured, cloudy and /or clumpy. Refer to manufacturer’s label for complete instructions.

💡 Insulin should not remain in your cartridge for more than 2 to 3 days. After that, you may see a reduction in its effectiveness as the insulin binds to the plastic cartridge.
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 healthcare professional. 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 odour
- Redness or warm area
- Fever or chills
- Pain or discomfort at the site
- Unexplained hyperglycaemia
- Nausea or vomiting

Make sure to report any of these symptoms to your healthcare professional 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. 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 Animas UK & Ireland on 0800 055 6606 (UK) or 1800 812 715 (Ireland).

Consult your healthcare professional if you are having problems with skin irritation or infection.
Appendix 3: Medical waste

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 full.

Used tubing without the needle, cartridges without the needle and other disposables can be discarded in regular household waste receptacles.
Appendix 4: 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

Type 1 Diabetes by Dr Ragnar Hanas

Think Like a Pancreas by Gary Scheiner

Websites

Below is a list of selected internet resources which you may find useful. Animas® does
not control the content of all these sites. Always consult your healthcare professional for
information specific to your needs.

Children with Diabetes
www.childrenwithdiabetes.co.uk

www.jdrf.org.uk Juvenile Diabetes Research Foundation International (JDRF)

Insulin Pumps
www.animascorp.co.uk
www.childrenwithdiabetes.co.uk
www.insulin-pumpers.org.uk

Exercise
www.runsweet.com

General Diabetes
http://www.diabetes.org.uk/
http://www.diabetes.co.uk/
Continuous Glucose Monitoring

www.DexCom.com or www.thecgmresourcecenter.com

DexCom company website.

Note: DexCom CGM systems are approved for children aged 2 years and older

Medic Alert Jewellery

www.medicaltags.co.uk
www.icegems.co.uk
www.medicalert.org.uk
www.universalmedicalid.com/uk

Insulin Pump Accessories

www.diabetesnet.com/pump_accessories
www.insulinpumpfashions.com
www.pumpwearinc.com
www.uniaccs.com/
www.angelbearpumpstuff.com
www.funkypumpers.com
www.wearingdabbee.com
Answers to: 
Test your knowledge questions

Page 6
1. True
2. Basal
3. 3-5 hours
4. Bolus
5. 4

Page 7
1. True
2. Exercise (or increased/decreased activity) and sick days

Page 9
1. b
2. a

Page 11

BG = 6.4 mmol/L  
Step One:  56 ÷ 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 = 11.2 mmol/L  
Step One:  56 ÷ 12 = 4.70 units for carbohydrate bolus  
Step Two:  
\[11.2 - 6 = 5.2\]  
\[5.2 ÷ 3.3 = 1.60\] units for BG bolus  
Step Three:  \[4.7 + 1.6 = 6.30\] units  
Answer: I need to bolus 6.30 units for lunch.

BG = 4.0 mmol/L  
Step One:  56 ÷ 12 = 4.70 units for carbohydrate bolus  
Step Two:  
\[4 - 6 = -2\]  
\[-2 ÷ 3.3 = - 0.60\] units for BG bolus  
Step Three:  \[4.70 - 0.60 = 4.10\] units.  
Answer: I need to bolus 4.10 units for lunch.
Answers to questions

Page 16
1. 1 to 1½ hours
2. 10
3. True
4. Approximately 60 grams
5. True

Page 18
1. Every 2-3 days, or as directed by your healthcare professional
2. True
3. Stomach

Page 23
1. I don’t take any intermediate or long-acting insulin
2. By a syringe or pen
3. Take insulin by syringe or pen, change infusion set/site, drink calorie free beverages, and continue to monitor BG

Page 25
1. 80 ml Lucozade, 4-5 glucose tablets
2. 15, 15
3. True
4. False

Page 26
1. False
2. Every 2-4 hours

Page 29
1. True
2. Eat a snack; decrease insulin
3. False

Page 37
1. 12
2. True
3. 4-5 hours
4. False
5. low-fat meal, easy to calculate carb amount

Page 50
1. a
2. c
My notes
My notes