Carbohydrate counting

What is carbohydrate counting?

All the food you eat is made up of carbohydrate, protein and fat or a mixture of these. The part that makes the biggest difference to your blood glucose levels is carbohydrate. Carbohydrate is turned into glucose by the body. The glucose is then moved into the blood for delivery to the cells where it is used to make energy. Insulin acts like a key and “unlocks” the gate for the glucose to move from the blood into the cells.

The more carbohydrate in the food or meal that you eat, the more fast-acting insulin you will need to give.

The aim of carbohydrate counting is to give you more freedom with your food, while still keeping those blood glucose levels within target. The two big benefits of carbohydrate counting are;

- Increased flexibility for meals and appetite. Snacking is also not essential.
- You can plan the best amount of insulin to give for your meals, thus helping blood glucose control.

Steps to carbohydrate counting:

Step 1: Look and see which foods contain carbohydrate.

Step 2: Work out the amount of carbohydrate in your meal.

Step 3: Work out the insulin to cover your meal. This includes:
  - Insulin for food
  - Extra insulin to correct high blood glucose levels
Step 4: Take into account other factors that may influence the insulin dose you give e.g. Activity/Exercise.

Step 5: Give your bolus adjusting your insulin dose and timing as appropriate.

Step 6: Keep records of your blood glucose levels, carbohydrate intake and activity.

Step 7: Look out for trends in your blood glucose levels and make changes to your insulin to carbohydrate ratio or phone/email your diabetes team for advice.

Step 1: Which foods contain carbohydrate?

Carbohydrate is found in most foods. It is also called sugar and starch. Have a look at the following list to see which ones you normally eat;

- Breakfast cereals – all types including Weetabix®, Bran Flakes®, Rice Krispies® and Shredded Wheat®.
- Breads – all types including whole grain, white and brown, bread rolls, chapattis, pittas and tortillas.
- Pasta, rice and noodles
- Potato, parsnip, sweet potato and sweetcorn
- Beans (ie baked, kidney) and lentils
- Crackers, crispbread, rice cakes and oat cakes
- Plain and savoury biscuits
- Sweet biscuits
- Milk, yoghurts and ice cream
- Fruit and fruit juices
- Honey, jams and sugar*
- Sweet puddings
- Chocolate and sweets*
- Cereal bars
- Regular fizzy drinks, regular squashes and Lucozade®*
- Processed, crumbed or coated meats
Sauces, gravy, some salad dressings

The foods marked with an * are those that contain a lot of sugar. It is best to not have these too often and when doing so, only small amounts.

Which foods contain very little or no carbohydrate?

The foods below contain little or no carbohydrate, and therefore do not really affect your blood glucose levels (when eaten in usual amounts).

You still need to eat some of these foods; you just do not “count” them when working out how much carbohydrate is in your meals.

- Salad: lettuce, tomato, peppers, cucumber and most other salad items.
- Vegetables: most (except potato, parsnip, sweet potato and sweetcorn).
- Fats: margarine, butter, oil and cream
- Sugar free fizzy drinks and squashes
- Plain meat, eggs, most nuts and cheese

Step 2: Work out the amount of carbohydrate

The key to mastering carbohydrate counting is to know how much carbohydrate is in your usual portions of food.

The things that you need to start counting include: kitchen scales, carbohydrate counting tables or a book, calculator, pen and paper and some cups and spoons.

For the first few weeks, you will need to weigh some of the food you eat (such as potato, pasta, breakfast cereals etc). It is also a good idea that once you know what your normal serving looks like – to measure it out in “cups or spoonfuls”, so that you don’t have to weigh it every time. Once you know how much the particular food weighs, you will need to calculate the carbohydrate content of this. There are a few different ways to do this – depending on what information you have at hand;

- Using the nutrition label (found on most packaged foods).
- Weighing on kitchen/food scales.
- Using carbohydrate counting tables or a carbohydrate counting book (there are many types available in your local bookshop)

Putting you first
Reading labels

All packaging labels have nutritional information about the calorie, protein, fat, carbohydrate and sugar content of the food. Most labels show the information per 100g and others per portion (or both). The portion information is useful for items such as biscuits, cereal bars, yogurts, where you would eat the whole portion.

Nutritional information can show different carbohydrate details e.g:

1. Carbohydrate – always included
2. Of which sugars – often included
3. Of which starch – sometimes included

Always use the total amount of carbohydrate in the food, which will be the largest figure and includes both the sugars and starch.

Using the “per serving” information

If you are using a nutrition label to work out the carbohydrate in your meal, the information will probably be presented similar to the following:

<table>
<thead>
<tr>
<th>Cracker bread</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition</strong></td>
<td><strong>Per cracker (approx. 33g)</strong></td>
</tr>
<tr>
<td>Typical Values</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>315kj / 75kcal</td>
</tr>
<tr>
<td>Protein</td>
<td>0.6g</td>
</tr>
<tr>
<td>Carbohydrate (CHO)</td>
<td>11.7g</td>
</tr>
<tr>
<td>Of which sugars</td>
<td>0.4g</td>
</tr>
<tr>
<td>Of which starch</td>
<td>11.3g</td>
</tr>
</tbody>
</table>

**Per serving column:** This is most helpful if it is exactly what you are having, or if you are having “a number of times” that amount. For example – the label for the cracker bread gives you the amount of carbohydrate per cracker, therefore if you were to have 1 cracker, it would be 11.7g CHO – the figure found in the first column next to carbohydrate. If you were having 3 crackers, the total amount would be $3 \times 11.7 = 35.1g$ (or 35g).
Quiz

Meaty Pizza
How much carbohydrate is in a serving?
How much carbohydrate is in half of the pizza?
How much carbohydrate is in a 200g serve? (answers at the bottom of this page)

Meaty Pizza (600g) | Per 100g | Per Serve (150g)
---|---|---
Energy | 220cals | 330cals
Carbohydrate | 30g | 45g
(of which sugar) | 2.2g | 3.3g
Fat | 16g | 24g

Brioche
How much carbohydrate is in 4 x brioches?

Per 100g | Per Brioche
---|---
Energy | 363 kcals | 141 kcals
Carbohydrate | 53.1g | 20.6g
Sugar | 19.3g | 7.5g
Starch | 26.3g | 10.2g
Fat | 13.2g | 5.1g

Weighing using the nutrition label – “per 100g column”

This can be used when the serving size that you are having is not able to be worked out directly from the label. In this case, you will need to weigh the food. As before, you still need the ‘total carbohydrates’ or ‘carbohydrate’ line of the label.

Per 100g (or mL) – Using this column, you can work out how much carbohydrate is in your serving by weighing the food and using the formula below. It is important that you use the correct value (i.e. sometimes it is listed as cooked or dry weight).

Answers to Carbohydrate counting questions.
Pizza: Serving = 45g CHO; ½ Pizza = 90g CHO; 200g = 60g CHO
Brioche: 20.6g x 4 = 82.4g

To calculate the amount of carbohydrate in a food that you have weighed:

Carbohydrate (CHO) content of your serving =
(CHO content per 100g ÷ 100) x Total Weight of food (g)
Example: Serving of rice (cooked)

<table>
<thead>
<tr>
<th>Nutrition</th>
<th>75g uncooked rice = 195g cooked rice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooked per 195g serve</td>
</tr>
<tr>
<td>Energy</td>
<td>1104kJ/260cal</td>
</tr>
<tr>
<td>Protein</td>
<td>5.3g</td>
</tr>
<tr>
<td>Carbohydrate of which sugars</td>
<td>60g</td>
</tr>
<tr>
<td></td>
<td>31g</td>
</tr>
</tbody>
</table>

Step 1: Weigh the portion of cooked rice. Let’s say it weighs 140g.

Step 2: From the label, there is 31g carbohydrate in 100g of cooked rice.

Step 3: Calculating carbohydrates for the serving → you will need to use the formula.

\[
\text{CHO content of your serve size} = \frac{\text{Weight of food (g)} \times \text{CHO content per 100g}}{100}
\]

\[
= \frac{31g \times 140}{100} = 43g 
\]

CHO is the serving of rice.

TIP: use “handy measures” such as cups or spoons to serve out your food and write them down. In the above example, you would discover that 195g cooked rice is 1 cup. Next time all you would need to do is measure out 1 cup (or part there of) and you would easily know how much carbohydrate is in the serving.

Using the Carbs and Cals book or App

Using the Carbs and Cals book or App which has photographs of different portions of foods and meals is a good way to help you estimate the amount of carbohydrate in your meals.

It is useful to weigh your food portions and double check that you have chosen the right photograph. You can check that weight of your chosen photograph matches your weighed portion of food by using the weight written in the tab below your chosen photograph. If your weighed food portion does not match any of the portions photographed you can use the following calculation to obtain a carbohydrate value.

E.g. Mashed potato has 19g of carbohydrate per 120g portion but your portion weighs 200g, therefore \((19 \div 120) \times 200 = 31g\) carbohydrate. Therefore your
portion of mash would contain 31g carbohydrate.

**Tips and hints**

1. When first starting out – mark the foods that contain carbohydrates and then do the calculations. For example, if you are having a jacket potato with baked beans and cheese, the foods that you need to count are the potato and the beans.

2. You need to be careful with some foods, such as pasta or rice. It can be listed as either “dry or cooked” weight, so you need to make sure you use the correct one according to when you weigh it.

3. Use the same glass/bowl/plate/cup/scoop to judge your portions sizes (i.e. for breakfast cereal or rice) – you just fill the measure up to the same spot every time. No need to worry about re-weighing.

4. For the common foods that you eat, write down your portion size and the amount of carbohydrate in them. Keep a pen and paper handy so you don’t forget.

5. You can also work out how much carbohydrate is in recipes. Start by working out what ingredients contain carbohydrates, and then calculate the amount in each of these ingredients; add them all together to get total carbohydrates for the complete recipe. Then all you need to do is divide this by the number of serving to get carbohydrate per serve.

6. Try to become familiar with what carbohydrate foods look like on a plate. This will help you judge how much carbohydrate is in your meals and snacks when you are away from home.

**Step 3: calculate the insulin dose to cover your food:**

**A.) Insulin for food**

Once you have learnt how to identify and count carbohydrates in your meals, you will be given something called an insulin to carbohydrate ratio. This helps you calculate how much insulin matches with the carbohydrate in your meal. Each person has their own ratio and your diabetes team will provide you with one. For example:
1 unit insulin for every 10g carbohydrate

Example:
Breakfast meal = 50g carbohydrate
Ratio = 1 unit insulin: 20g carbohydrate

Bolus dose = total carbohydrate (50g) ÷ Ratio (20)
= 2.5 units insulin

Your turn to practice:

You have eaten: 30g carbohydrate for lunch
Your ratio is: 1 unit insulin for every 12g carbohydrate

Your Answer:

B.) Extra insulin to correct high blood glucose levels:

If your blood glucose level is high you can give extra insulin to bring your blood glucose back into target or goal range. You can do this by giving extra rapid acting insulin at meal times and at other times.

Correction factor or insulin sensitivity factor (ISF):

A correction factor is how much 1 unit of quick acting insulin will lower your blood glucose level.

Each person has their own individually calculated correction factor. For example one person may find that 1 unit of quick acting insulin lowers the blood glucose by 3mmol/L, whereas for another person 1 unit lowers blood glucose by 5mmol/L.

Your diabetes team will estimate your correction factor or they can teach you how to do this. Once you know your correction factor you can calculate how much quick acting insulin is needed to bring a high blood glucose level back into target range. The amount of insulin given is referred to as a correction bolus or a correction dose.
**Correction bolus**

The formula that is used to calculate a correction bolus (CB) is:

\[ CB = \frac{\text{Current blood sugar} - \text{target blood sugar}}{\text{Correction factor}} \]

**Example:**
Pre-meal blood glucose level: 16mmol/L  
Target blood glucose level: 6mmol/L  
Correction factor: 2mmol/L

\[ CB = \frac{(16\text{mmol} - 6\text{mmol})}{2} = 5 \text{ units quick acting insulin.} \]

**Your turn to practise:** Use the example below to calculate how much extra quick acting insulin you need.

**Example:**
Pre-meal blood glucose level: 18mmol  
Target blood glucose level: 6mmol  
Correction factor: 6mmol

**Answer:**

**Extra notes – correction factor**

1. Only give a correction bolus if the amount needed is at least ½ unit.

2. Correction factors can change over time depending on your sensitivity to insulin. If you notice a pattern of blood glucose levels not coming back into target range within 3 – 4 hours of giving a correction bolus, consider changing your correction factor.

3. If you are having to give correction doses often, contact the diabetes team as your ratios may need to be reviewed.

**Guideline and caution for using correction boluses:**

- Check blood sugar 2 – 3 hours after correction bolus to check it has worked.

- Do NOT give correction bolus if blood sugar is less than your target range.
• Do NOT correct if it has been less than 2 hours since your last correction bolus.

• If a correction bolus is given between meals the dose may need to be lower than usual.

C.) Final step: Combine the insulin dose for the food and/or correction dose:

<table>
<thead>
<tr>
<th>Insulin: carbohydrate ratio = 1 unit of insulin or every 10g of carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total carbohydrate at breakfast = 20g</td>
</tr>
<tr>
<td><strong>Carbohydrate bolus</strong> = 20g /10g = 2 units quick acting insulin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correction factor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-meal blood glucose level = 14mmol</td>
</tr>
<tr>
<td>Target blood glucose level = 6mmol</td>
</tr>
<tr>
<td>Correction factor = 2mmol</td>
</tr>
<tr>
<td><strong>Correction bolus</strong> = (14 — 8) ÷ 2 = 4 units quick acting insulin</td>
</tr>
</tbody>
</table>

Therefore, you need IN TOTAL:

2 unit (for food) + 4 units (to correct high blood glucose) = total dose of 6 units quick acting insulin before eating.

Step 4: other factors that may influence the insulin dose:

1. If you are planning to do activity soon after a meal consider taking 10 – 30% off your calculated quick acting insulin dose.

2. If you are eating a large meal that is high in fat and protein there is the possibility that your blood sugar may go low and then high later – consider splitting the dose of insulin and give ½ before and ½ 30minutes to 1 hour into the meal.

3. If you have a very large carbohydrate rich meal, also consider splitting the dose.
Step 5: Adjusting insulin doses:

In order to adjust insulin doses you need to know which insulin has the greatest effect on blood glucose levels at different times.

<table>
<thead>
<tr>
<th>Insulin</th>
<th>Affects</th>
<th>Blood sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evening basal (Lantus or Levermir or Degludec)</td>
<td>&gt;&gt;</td>
<td>Overnight Before breakfast</td>
</tr>
<tr>
<td>Breakfast rapid (Novorapid, Humalog, or Apidra)</td>
<td>&gt;&gt;</td>
<td>2hrs after breakfast before lunch</td>
</tr>
<tr>
<td>Lunch rapid</td>
<td>&gt;&gt;</td>
<td>2hrs after lunch before tea time</td>
</tr>
<tr>
<td>Teatime rapid</td>
<td>&gt;&gt;</td>
<td>2hrs after tea before bed</td>
</tr>
</tbody>
</table>

How to test that your insulin to carbohydrate ratio is right:

To test to see if you are giving the correct bolus for the carbohydrate in your food the following test can be done:

Note: This test should not be done on a day that you are unwell, stressed or had a hypo in the last 6—12 hours, or done more exercise than usual.

1. Test your blood glucose level before your meal. You should not have done any insulin boluses during the previous 4 hours before this meal.

2. Make sure you have correctly counted the carbohydrate value of your meal.

3. Give your usual insulin to carbohydrate bolus.

4. Check your blood sugars 2 and 4 hours after your meal.

5. If the blood sugar is out of target review your insulin to carbohydrate ratio.

6. If at any stage during the test your blood sugars level drops below 4mmol/L stop and treat your hypo.

Speak to your diabetes team about how much you should adjust your ratio to improve blood glucose levels.
Start identifying the foods you eat that contain carbohydrate and calculating how much carbohydrates are in these foods.

You need to fill out a five a day food diary (please contact the Diabetes team if you don’t have one). We ask that you record the food and amount of carbohydrate in them, as well exercise, your insulin doses and blood glucose readings.

Post, email or bring your completed food diary to your appointment.

The Diabetes team will check your counting and calculate your Insulin: Carbohydrate Ratio (I : CHO).

You will get some ratios which guide you to the right amount of insulin to give for the carbohydrates that you eat. Sometimes they can be different for each meal.

We ask that you call/email the Diabetes Team after a week or so and give them your blood glucose readings (unless you are having problems before this). It is important that we check the ratios are right and that things are going well.

If you would like any information regarding access to the West Suffolk Hospital and its facilities please visit the website for AccessAble (the new name for DisabledGo) https://www.accessable.co.uk/organisations/west-suffolk-nhs-foundation-trust

© West Suffolk NHS Foundation Trust