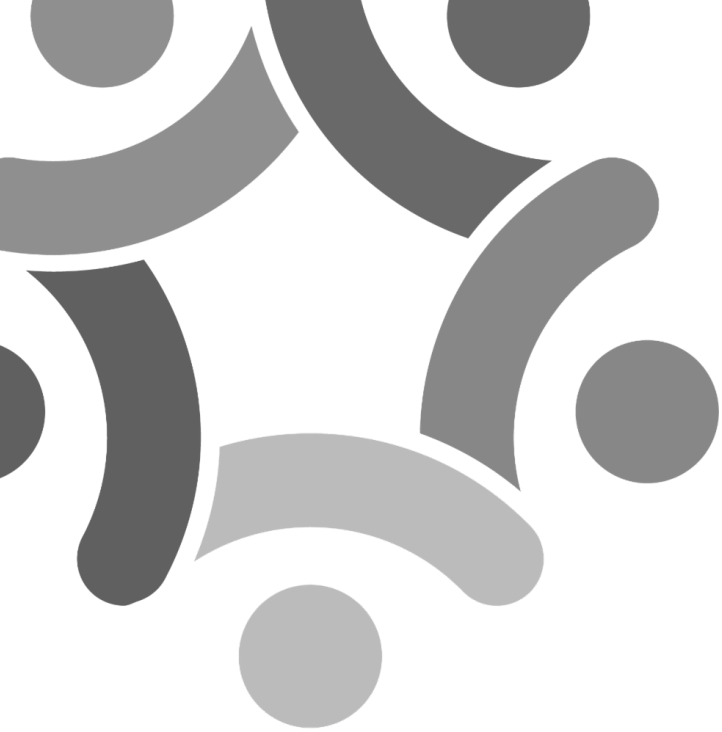


NHS
Royal Berkshire
NHS Foundation Trust

Quick guide to carbohydrate counting and dose adjustment

Information for people with Type 1 diabetes

This booklet is designed to provide a basic overview of carbohydrate counting and insulin dose adjustment

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Helpful resources to manage your diabetes

One year after diagnosis, you will be provided with the opportunity to attend our structured education programme called CHOICE, which provides an in-depth look at carbohydrate counting and general diabetes management. If you would like to attend the course and have not yet been referred, please let the diabetes team know.

BERTIE online is also an excellent online self-paced resource covering carbohydrate counting in detail with videos and exercises to work through. Visit: https://bertiediabetes.com

If you have been referred for an insulin pump, you will be provided with a short refresher course on carbohydrate counting and dose adjustment as part of the process.

If you are already using pump therapy or do not think the above options would suit you, please contact the diabetes team and one-to-one carbohydrate counting support can be arranged.

Carbohydrate counting

Carbohydrate counting allows you to manage your glucose levels by matching the amount of quick-acting insulin you take to the amount of carbohydrates found within meals, snacks and drinks. This allows you to eat and drink flexibly (rather than needing to eat similar meals) and enables you to manage your glucose more accurately.

Carbohydrates can be found in a wide range of foods such as:

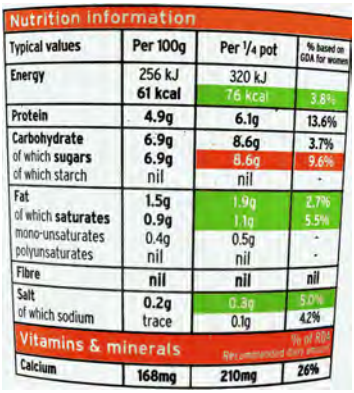
- Fruits and starchy vegetables
- Milk, yoghurt, custard
- Cakes, biscuits, sweets, chocolate, crisps, jams and some drinks
- Bread, rice, pasta, couscous, chapattis, cereal

This is a brief list, and food and drink labels should be checked to see if they contain carbohydrates.

There are various methods of carbohydrate counting, as seen below.

Using food labels

Food labels can be found on most foods and can be used to look at how much carbohydrate will be eaten. Often the portion size on the food label will be different from the portion size you plan to eat. In this scenario you can use the formula below to work out how much carbohydrate is in your portion:



Nutrition information			
Typical values	Per 100g	Per 1/4 pot	% based on GDA for women
Energy	256 kJ 61 kcal	320 kJ 76 kcal	3.8%
Protein	4.9g	6.1g	13.6%
Carbohydrate of which sugars of which starch	6.9g 6.9g nil	8.6g 8.6g nil	3.7% 9.6% -
Fat of which saturates mono-unsaturates polyunsaturates	1.5g 0.9g 0.4g nil	1.9g 1.1g 0.5g nil	2.7% 5.5% - -
Fibre	nil	nil	nil
Salt of which sodium	0.2g trace	0.3g 0.1g	5.0% 4.2%
Vitamins & minerals			% of RDA
Calcium	168mg	210mg	26%

Carbohydrate formula:

Grams of carbohydrate per 100g (C) / weight in grams (W)

x My Portion (M)

= grams of carbohydrate in your portion

Below is an example of how to use this formula to calculate the amount of carbohydrate in your food or drink:

Nutritional label		
Typical values	Per 100g	Per 40g serving
Energy	1626 kJ	904 kJ
	385 kcals	214 kcals
Fat	5.2g	4.1g
of which saturates	0.9g	1.5g
Carbohydrates	70g	34g
of which sugars	23g	15g
Fibre	8.5g	3.4g
Protein	11g	9g
Salt	0.69g	0.43g

The weight of my portion is: 82g

70 g / 100 x 82 g = **57.4g**

My portion of cereal contains **57g of carbohydrate**.

"It is likely I would have milk with my cereal! Therefore, I would do the same process for my milk and then add both together to work out the total amount of carbohydrate in my meal"

The "per serving" or "per portion" column on the food label can be used for times when you will have that exact amount. This is useful for foods such as bread rolls, cereal bars, and packets of crisps or microwave meals.

Also be sure to check whether the carbohydrate content listed on the label is for the food when cooked or uncooked and check against the appropriate reference range, i.e. check cooked pasta against cooked pasta.

Using Apps



Many people find mobile apps a handy tool for carbohydrate counting, allowing them to simply weigh their food and enter the food type into the app to quickly calculate the carbohydrates of their meal.

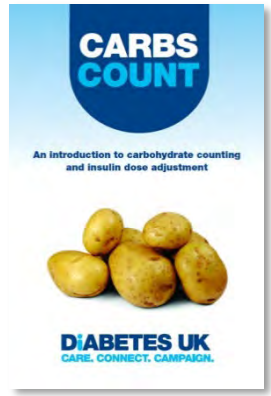
Some apps, such as Carbs & Cals, also have pictures with different portion sizes you can select to make counting carbohydrates easier and quicker. This is especially useful when weighing food is tricky, for example, when out for dinner or at a friend's house.

Examples of apps include:

- Carbs & Cals https://carbsandcals.com/product/app/
- Nutracheck www.nutracheck.co.uk/Home
- MyFitnessPal www.myfitnesspal.com

Please note, there may be a charge for using these apps.

Using reference tables



Reference tables provide the carbohydrate content of many different foods. Diabetes UK have a free e-book the "Carbohydrate Reference List" which can be found using the following link: https://shop.diabetes.org.uk/products/carbs-count-e-book

Carbs & Cals also have a reference book with pictures of different portion sizes of many foods. This can be purchased from most book stores (ISBN-10: 1908261153)

Using handy measures

Some people create their own ‘frequent foods list’ of foods and drinks they have regularly, using set measuring sizes, to help with their day-to-day.

Insulin to Carbohydrate Ratios (ICR)

ICR or ‘ratios’ are used to calculate how much quick-acting insulin you need for any given amount of carbohydrate in your food and drinks. You can use the formula below to calculate how much insulin you require for the amount of carbohydrate you are taking.

Carbohydrate content of meal / Insulin to Carbohydrate Ratio = Quick-acting meal bolus insulin units

Below is an example of how to use a ratio after calculating the amount of carbohydrate in your food or drink. In this example, this person needs one unit of insulin for every 10 grams of carbohydrate they eat.

Amount of carbohydrate in meal: 48 grams
Insulin to Carbohydrate Ratio: 1 unit: 10 grams
48 grams / 10 grams = 4.8 (round up to take 5 units)

Ratios vary from person to person and can vary by time of day. Some people also use different ratios for different types of days such as “active” and “non-active days”. If you are not sure what your insulin to carbohydrate ratio/s is, contact your diabetes team for support.

Timing

It is important that your insulin is taken **before** your meal, at the time suggested by your diabetes team, often approximately 10 minutes before eating. This is to ensure your insulin is active by the time your glucose levels start to rise from the carbohydrate you have eaten.



Insulin Sensitivity Factor (ISF)

The ISF describes how much 1 unit of quick-acting insulin will lower your glucose. You will often also hear this referred to as the "correction factor". You can use the below formula to calculate the units of insulin needed to bring your glucose level into range.

(Current glucose – target glucose) / Insulin Sensitivity Factor = number of units of quick-acting insulin

The below example may make this clearer:

If your current glucose is: 15 mmol/L
And your target glucose is: 5-7 mmol/L (mid-point: 6 mmol/L)
And your Insulin Sensitivity Factor: 1 unit: 3 mmol/L

(15 mmol/L – 6 mmol/L) / 3 mmol/L = 3 units

In this example, 1 unit of quick-acting insulin will bring your glucose down by 3 mmol/L. Therefore, you would expect 3 units to bring glucose down by 9 mmol/L from 15 mmol/L to the target of 5-7 mmol/L.

ISFs vary from person to person and can vary at different times of day. If you are not sure what your ISF is or what your personal glucose target is, contact your diabetes team for support.

Insulin stacking

Quick-acting insulin usually has an action time of approximately 4 hours. This means it may take up to 4 hours to reach your target glucose level. Therefore, multiple injections of quick-acting insulin to lower glucose in a short period of time can lead to sudden drops in your glucose, increasing the risk of getting low glucose (hypoglycaemia).

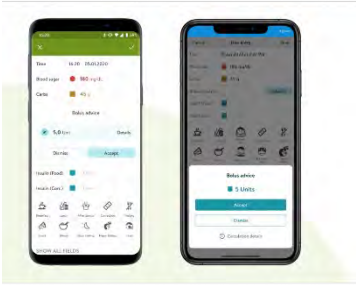


Multiple injections for carbohydrate over that period is expected, however avoid insulin “stacking” by not injecting for above range glucose more than every 3 to 4 hours.

If you are using an insulin pump or Hybrid Closed Loop system (an insulin pump and sensor that communicate with each other), the pump will consider the amount of insulin you have in your system, and so it is important not to give additional insulin above the suggested bolus dose, as this can lead to hypoglycaemia. Except in case of sickness or pump / system failure.

Bolus calculator

Bolus calculators can be programmed with your Insulin-to-Carbohydrate Ratios and Insulin Sensitivity Factor, to help make it easier to calculate the insulin dose based on the carbohydrate you plan to eat and your current glucose level. They also consider the insulin already in your body and therefore, when used regularly, can reduce the risk of developing low glucose (hypos). Examples include MySugr, Diabetes:M, and Hedia apps, which can be downloaded from your mobile phone’s app store.



Bolus calculators can only work well if the ratio and sensitivity factor that they are programmed with are correct. Therefore, it is important to review these with the diabetes team. Furthermore, you should always use your judgement when deciding on how much insulin to give yourself.

If you would like help setting up a bolus calculator, please do not hesitate to contact the diabetes team.

Mealtime insulin

Your ISF and ratio can be used together at mealtimes as shown in the example below. This enables you to provide the correct amount of insulin for the carbohydrates you are eating and help get your glucose to within range, which might reduce the need for additional injections.

For example:

The amount of carbohydrate in your meal is: 48 grams

And your ratio is 1 unit: 10 grams. So you will need 5 units for the carbohydrate (48 grams / 10 grams = 5 units)

However, you also need to bring your glucose down to range and before your meal your glucose is 15 mmol/L. Your ISF is 1 unit: 3 mmol/L, and so using this factor you need an extra 3 units to bring your glucose to range (15 mmol/L – 6 mmol/L) / 3 mmol/L = 3 units

5 units + 3 units = 8 units for pre-meal injection

Therefore, a total of 8 units should be injected to both provide the correct amount of insulin for the carbohydrates you are eating and reduce your glucose to within range.



It is important to use your ratio every time you have food or drink that contains carbohydrate (please note alcoholic drinks are managed differently).

When taking quick-acting insulin it is always important to consider the insulin you already have in your system – sometimes we call this “insulin on board”.

If you eat again within 3 hours of your last meal, for example snacks or a pudding, you should only inject for the extra carbohydrate and not use the ISF. This will help prevent insulin stacking.

Adjusting insulin to carbohydrate ratio and insulin sensitivity factor

When you first start using your ratio and ISF, it is likely they will need adjusting. It is likely that your insulin requirements will change through different periods of your life, meaning your ratio and ISF may need to be changed from time to time. Below is a quick guide on how they can be adjusted. For further information, please do not hesitate to contact the diabetes team.

Adjusting Insulin to Carbohydrate ratios

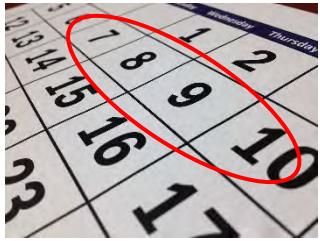
It is recommended you review whether your ratio is working by looking at the pattern of what is happening at a particular meal, when your glucose levels are below 10 mmol/L (if possible) and not on days when other factors are influencing your glucose levels, such as days with:

- alcohol
- snacking or carb containing drinks outside of mealtimes
- strenuous activity
- higher than normal stress (if possible)
- when you have had a low glucose in the last 12 hours (hypoglycaemia)

If you develop hypoglycaemia, ensure you treat this and consider whether you need to change your ratio because of this. Of course, you can contact the diabetes helpline if you are unsure.

When checking your ratio, it is important to ensure your carbohydrate counting is accurate. It is also best if you have balanced meals when checking your ratio, with moderate amounts of carbohydrates, protein and vegetables and not excessively high fat.

Evidence suggests trying a ratio for 3 days before adjusting it again, to look for a pattern and avoid making changes based on other one-off factors influencing your glucose.



Some people find it best to focus on one meal and one ratio at a time. For example, first focusing on your breakfast ratio and ensuring this is optimised before moving on to your lunch ratio.

To check your ratio, follow these steps:

1) Accurately carbohydrate count your meal (including all food and drink)
2) Calculate how much insulin you need to take with your meal using your ratio
3) Check your glucose and take your insulin 10 minutes before your meal
4) Check your glucose 4 hours later (or before your next meal)
5) If your ratio is optimised, your glucose should be at a similar level to your pre-meal glucose
6) If your glucose is more than 2 mmol/L higher or lower than your pre-meal glucose, your ratio needs to be adjusted

If your glucose is higher after your meal, your ratio needs to be strengthened. You could strengthen your ratio gradually, 1 to 2 grams at a time. For example if 1 unit : 10 grams is not working, try 1 unit : 9 grams.

If your glucose is lower after your meal, your ratio needs to be weakened.

If you are not sure which direction to move in, try looking at the chart below.

If your glucose is higher after the meal, your ratio needs to be strengthened.

If your glucose is lower after the meal, your ratio needs to be weakened.

1 unit : 7 grams
1 unit : 8 grams
1 unit : 9 grams
1 unit : 10 grams
1 unit : 11 grams
1 unit : 12 grams
1 unit : 13 grams

Please note: 1 unit : 7 grams carbohydrate is a much stronger ratio than 1 unit : 13 grams

Optimising insulin sensitivity factors (ISF)

Once your ratios are optimised, you can also assess if your ISF is working well at mealtimes. Similar to your ratio, the accuracy of your ISF can be judged based on the glucose reading four hours after your ISF bolus injection, provided you haven't eaten, exercised or taken additional insulin during this time.

If your ISF is optimised your glucose should reach your target by 4 hours after taking a correction.

If your glucose are lower than expected 4 hours after giving a correction, your ISF is too strong.

If your glucose are higher than expected 4 hours after giving a correction your ISF is too weak.

For example:

- If you check the ISF 1 unit : 3 mmol/L aiming for a target for 6 mmol/L, when your glucose are 15 mmol/L, you expect 3 units to drop you by 9 mmol/L
- However, if 4 hours after taking this correction, your glucose are at 9 mmol/L rather than 6 mmol/L, this may indicate that the ISF is too weak so will need adjusting to make it stronger (e.g. 1 unit : 2 mmol/L)

You can also calculate your ISF based on the drop in glucose you see:

For example:

- If 2 units drop glucose from 15 mmol/L to 9 mmol/L after 4 hours
- This is a 6 mmol/L reduction for 3 units
- So you could expect that 1 unit to drop glucose by 2 mmol/L
- Therefore giving an ISF of 1 unit : 2 mmol/L.

Again, when adjusting your ISF you should do this gradually, the chart below can help. Try moving 0.5-1 mmol/L at a time. Some people find they need a more specific ISF, for example 1 unit : 2.5 mmol/L.

If your glucose are higher than expected, your ISF needs to be strengthened

If your glucose are lower than expected, your ISF needs to be weakened

1 unit : 1 mmol/L
1 unit : 1.5 mmol/L
1 unit : 2 mmol/L
1 unit : 3 mmol/L
1 unit : 4 mmol/L
1 unit : 5 mmol/L
1 unit : 6 mmol/L
1 unit : 7 mmol/L

Please note:
1 unit : 1mmol/L is a much stronger ISF than 1 unit : 4mmol/L

Contact us

Your diabetes team can be contacted via phone or email for support.



Diabetes Nurse Phone line:
0118 322 7478

Diabetes Specialist Nurses email:
rbb-tr.diabetes.nurses@nhs.net

Diabetes Specialist Dietitian email:
rbb-tr.dietitians@nhs.net

Notes

To find out more about our Trust visit www.royalberkshire.nhs.uk

Please ask if you need this information in another language or format.

RBFT Diabetes Team/Dietetics, October 2026
Next review due: October 2028