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Carbohydrate Counting: Advanced

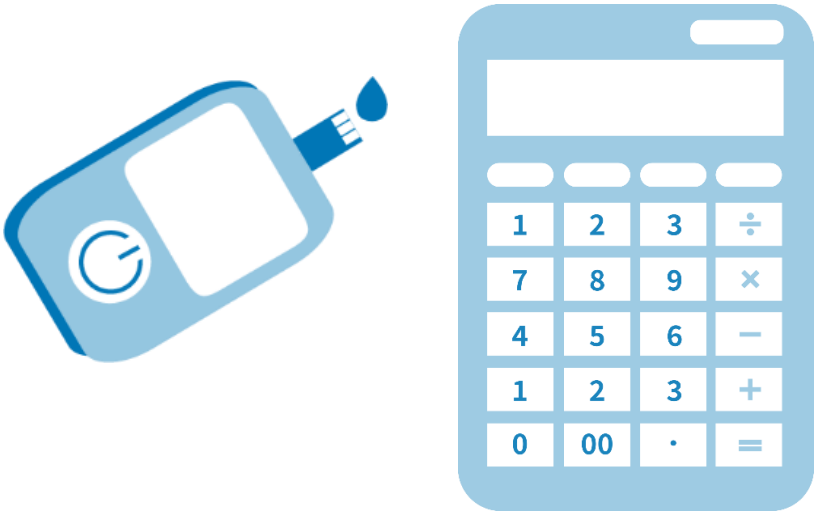


Table of Contents

Carbohydrate Counting - What is it?

Carbohydrate (we often say carbs) is the nutrient with the greatest effect on your blood sugar level. “Carbohydrate counting” is way of keeping track or counting how much carbohydrates you are eating to help manage your blood sugars.

Whether you use insulin or not, carbohydrate counting allows you to be more flexible with meal planning and improve blood sugar control.

If you are using multiple daily injections of insulin or an insulin pump, carbohydrate counting allows you to match your insulin dose with the amount of carbohydrate in your meals and snacks.

By “thinking like a pancreas”, you can correct for high and low pre-meal blood sugar by adjusting your insulin dose.

To be successful, you need to be able to do all of these things:

- ☐ be willing to count your carbs
- ☐ take the time needed to focus on managing your diabetes
- ☐ read food labels
- ☐ count carbohydrates
- ☐ do the math (add, subtract, multiply, and divide)
- ☐ understand how insulin works
- ☐ understand the relationship between carbohydrate and insulin
- ☐ adjust insulin based on your food intake, exercise, and blood sugar level

Blood Sugar Targets

- Pre-meal level 4.0 to 7.0 mmol/L
- 2-hour post-meal level 5.0 to 10.0 mmol/L

  After eating, a rise of 2.0 to 3.0 mmol/L is normal.

Carbohydrate Goals

- Each meal* 2 to 4 carbohydrate choices or 30 to 60 grams

  * Active people might need more

- Each snack** 1 to 2 carbohydrate choices or 15 to 30 grams

  ** Not everyone needs to snack.

  If you do snack, you might need to inject extra insulin. Talk to your doctor or diabetes educator about this.

Carbohydrate serving size: 1 serving or portion equals 15 grams of carbohydrate

For serving examples, see either of these resources available online at patienteduc.fraserhealth.ca:

Carbohydrate Choices handout

On the Road to Diabetes Health booklet (Page 20)

Carbohydrate Counting and Insulin Correction

One way to reach the recommended targets for blood sugar levels is to adjust your insulin to work with these 3 things:

- the amount of carbohydrate you eat
- your activity level
- your blood sugar level

Basal Insulin

This is your background insulin supply. Your body needs to have insulin available even when you are not eating. Basal insulins include intermediate-acting such as Humulin® N and Novolin® NPH, and long-acting such as, Basaglar®, Lantus®, Levemir®, Toujeo®, and Tresiba®.

Type	Onset	Peak	Duration
Humulin N®	1 to 3 hours	5 to 8 hours	up to 18 hours
NPH®	1 to 3 hours	5 to 8 hours	up to 18 hours
Basaglar®	90 minutes	None	24 hours
Lantus®	90 minutes	None	24 hours
Levemir®	90 minutes	None	16 to 24 hours
Toujeo®	90 minutes	None	More than 30 hours
Tresiba®	90 minutes	None	42 hours

Bolus Insulin

You can use this insulin in 2 ways:

1. when you are eating a meal or snack with carbohydrates (meal bolus)
2. to correct a high blood sugar (correction bolus)

Bolus insulins include rapid-acting insulin such as Apidra®, Fiasp®, Admelog®, and Trurapi®.

Type	Onset	Peak	Duration
Apidra®	10 to 15 minutes	60 to 90 minutes	3.5 to 5 hours
Fiasp	4 minutes	60 to 90 minutes	3 to 5 hours
Admelog®	10 to 15 minutes	60 to 120 minutes	3 to 4.75 hours
Trurapi®	9 to 20 minutes	60 to 90 minutes	3 to 5 hours

1. Meal Bolus

   Your meal bolus depends on:

   - the amount of carbohydrate you eat
   - your **insulin to carbohydrate ratio** or ICR

Your ICR is the amount of carbohydrate one unit of rapid-acting insulin "covers" for a meal. ICR varies from person to person.

2. Correction Bolus

   Your correction bolus depends on:

   - your blood sugar reading
   - your **insulin sensitivity factor** or ISF, also called correction factor

Your ISF is the amount that one unit of rapid insulin lowers your blood sugar. ISF varies from person to person.

Note: Leave at least 4 hours between injections of bolus insulin, either meal or correction doses.

If you use an insulin pump, discuss your needs with your doctor or diabetes educator.

Matching Carbohydrate, Activity Levels, and Bolus Insulin Doses

Step 1: Identify the carbs

Identify the foods in your meal that contain carbohydrates.

Examples: grains, starches, fruit, starchy vegetables, milk, milk alternatives, sweet foods

Step 2: Count the carbs

Count the total amount of carbohydrates in your meal using carbohydrate servings, food package labels (Nutrition Facts table), or other resources such as those listed on our Carbohydrate Counting – Resources handout.

Example: A sandwich, glass of milk, and an apple together equals 60 grams of carbohydrate.

Note: Don't forget to subtract the fibre and sugar alcohol.

Step 3: Calculate meal bolus

Calculate how much rapid-acting insulin you need to match how much carbohydrates you're eating.

Take the total carbohydrates for the meal and divide it by your **insulin to carbohydrate ratio** (ICR).

Your ICR might be different for each meal. It might also depend on changes in your weight, changes in your fitness level, and changes in your hormones.

Make sure you talk with your doctor or diabetes educator about your ICR.

Example: If your ICR is 1:10 and your total meal carbs is 60 grams, then you calculate like this: 60 ÷ 10 = 6
Your meal bolus would be 6 units.

☐ My ICR is:

Breakfast:	1 unit	_____g of carbohydrate
Lunch:	1 unit	_____g of carbohydrate
Dinner:	1 unit	_____g of carbohydrate

Step 4: Check blood sugar

Check your blood sugar before you eat (your pre-meal blood sugar).

Record your blood sugar reading on the **Carbohydrate Counting Daily Worksheet** (see page #9).

Step 5: Calculate correction bolus

Any time your pre-meal blood sugar is above your target blood sugar, you need to adjust your insulin using your **insulin sensitivity factor** (ISF).

By using your ISF, you can decide how much extra insulin you need to add to your meal bolus to bring your blood sugar back to your target blood sugar. Your doctor or diabetes educator helps you find out your ISF.

You can find your correction bolus in one of 2 ways.

- **Option 1:** Calculate it.
  a) Subtract your pre-meal target blood sugar from your pre-meal blood sugar reading.
  b) Divide this number by your ISF for the correction bolus units.
- **Option 2:** Use the ISF scale your doctor or diabetes educator gave you.

Example: Pre-meal blood sugar is **13**mmol/L
Target blood sugar is **7**mmol/L
ISF is 1:**3**
Using Option 1 a) 13 mmol/L – 7 mmol/L = 6 mmol/L
b) 6 mmol/L ÷ 3 = 2 units
Using Option 2 Refer to your ISF or correction scale.

☐ My target blood sugar is _____ mmol/L.

☐ My correction bolus (ISF) is 1 unit for every _____ mmol/L over my target pre-meal blood sugar.

☐ My correction scale is:

Pre-meal blood sugar	Adjust insulin by:
	0 unit
	+1 unit
	+2 units
	+3 units
	+4 units
	+5 units

Step 6: Calculate insulin dose

Now add your meal bolus and your correction bolus together. This gives you the total number of units of insulin to inject for the meal.

Example: Your meal bolus is 6 units. Your correction bolus is 2 units.
Calculate like this: 6 + 2 = 8
You would inject 8 units.

Step 7: Adjust for activity

If you expect you will be more active than usual within 2 hours of injecting your bolus insulin, you might need to reduce the bolus dose by 25% to 75%, depending on the activity.

Talk to your doctor or diabetes educator about different activities. Ask how much you need to reduce the bolus dose for your activities.

Step 8: Inject, eat, record

Inject your total bolus dose. Eat your meal.

Record the food eaten, the total amount of carbohydrates, and the amount of insulin you gave yourself on the **Carbohydrate Counting Daily Worksheet** (see page #9).

Step 9: Check blood sugar

Check blood sugar 2 hours after eating (post-meal blood sugar) to confirm that your ICR and ISF are correct for that meal.

Record the blood sugar reading on the **Carbohydrate Counting Daily Worksheet** (see page #9).

When not using a correction bolus, the meal bolus is correct if your 2-hour post-meal blood sugar is within 3 mmol/L of your pre-meal blood sugar.

Example: Your pre-meal blood sugar was 13 mmol/L.
Your post-meal blood sugar = 8.0 mmol/L.
ICR and ISF are correct.

When using a correction bolus, the total insulin bolus is correct if your 2-hour post-meal blood sugar reaches your target post-meal blood sugar.

☐ My target post-meal blood sugar is _____ mmol/L.

If your readings are not at target, your ICR and ISF might not be correct. Ask your doctor or diabetes educator for help.

Activity

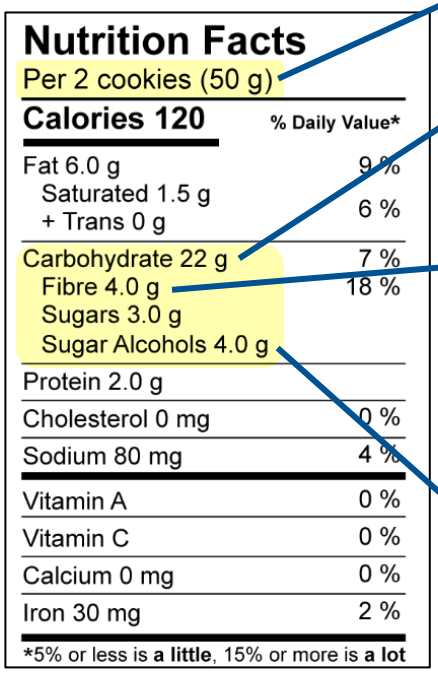
Anytime you increase your activity level, you might need to increase your carbohydrate intake, reduce your insulin dose, or both.

Example: If you are not reducing your insulin, you might need 15 grams of extra carbohydrate for every 30 to 60 min of extra activity.

Blood sugar testing can help you decide what your insulin needs are.

Talk with your doctor or diabetes educator more about what will work best for you.

Reading Labels for Fibre and Sugar Alcohols



Nutrition Facts

Per 2 cookies (50 g)	
Calories 120	**% Daily Value***
Fat 6.0 g	9 %
Saturated 1.5 g + Trans 0 g	6 %
Carbohydrate 22 g	7 %
Fibre 4.0 g	18 %
Sugars 3.0 g	
Sugar Alcohols 4.0 g	
Protein 2.0 g	
Cholesterol 0 mg	0 %
Sodium 80 mg	4 %
Vitamin A	0 %
Vitamin C	0 %
Calcium 0 mg	0 %
Iron 30 mg	2 %

*5% or less is **a little**, 15% or more is **a lot**

Look at the serving size.
Example: 2 cookies or 50 g

Based on the serving size, calculate the amount of carbohydrate you are eating.
Example: 22 g carbohydrate if eating 2 cookies

Subtract the fibre from the carbohydrate since fibre does not raise your blood glucose level.
Example:
22 g total carbohydrates – 4 g fibre
= 18 g carbohydrates

Subtract the sugar alcohols from the available carbohydrate. Sugar alcohols have no significant effect on your blood glucose level.
Example:
18 g carbohydrate – 4 g sugar alcohols
= 14 g net carbohydrates

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Carbohydrate Counting Daily Worksheet

Date: _____

Basal insulin: _____ Morning dose: _____ Evening dose: _____

Bolus insulin: _____ ICR: 1 u for _____ g carbs ISF: 1 u for _____ mmol/L

Meal	Food Eaten (include portions)	Total Carbs (grams)	Bolus Insulin	
Breakfast				
Time:			Meal bolus	____ u
			+ Correction bolus	____ u
Pre-meal BS:			= Total insulin	____ u
2 hr post-meal BS:			Adjust for exercise: ☐ Yes ☐ No	
Morning Snack				
Time:				
Lunch				
Time:			Meal bolus	____ u
			+ Correction bolus	____ u
Pre-meal BS:			= Total insulin	____ u
2 hr post-meal BS:			Adjust for exercise: ☐ Yes ☐ No	
Afternoon Snack				
Time:				
Dinner				
Time:			Meal bolus	____ u
			+ Correction bolus	____ u
Pre-meal BS:			= Total insulin	____ u
2 hr post-meal BS:			Adjust for exercise: ☐ Yes ☐ No	
Bedtime Snack				
Time:				
BS:				

Abbreviations: BS = blood sugar g = grams ICR = insulin to carbohydrate ratio ISF = insulin sensitivity factor u = units

Baking and Counting Carbohydrates

Chocolate Chip Cookie Bars[1]

Servings: Makes 24 soft, chocolaty, and rich cookie bars.

Ingredients:	**Carbs** (grams)	**Fibre** (grams)
1 cup (250 mL) whole wheat flour	92	16
1 tsp (5 mL) baking soda	-	-
¼ tsp (1 mL) salt	-	-
½ cup (125 mL) non hydrogenated margarine	-	-
¾ cup (175 mL) brown sugar	170	-
1 tsp (5 mL) vanilla	-	-
1 egg	-	-
¾ cup (175 mL) chocolate chips	84	3.3
Total	346	19.3

Available carbohydrate: 346 g carb – 19.3 g fibre = 326.7 g available carb
Divide 326.7 g by 24 servings. You get 13.6 g available carbohydrate per serving!

Make sure the number of servings you make are the same as what the recipe says. If not, you will have to adjust your calculations.

Method:

1. Preheat over to 350 F (175 C)
2. Spray an 8 by 8 inch (20 cm by 20 cm) square pan with non-stick cooking spray.
3. Sift together the flour, baking soda, and salt.
4. Beat together the margarine and brown sugar until light and fluffy.
5. Add the vanilla and the egg. Beat well.
6. Gradually add the flour mixture to the egg mixture. Mix well.
7. Stir in the chocolate chips, mixing only until they are well distributed.
8. Scrape into prepared pan, smoothing into the corners.
9. Bake at 350° F (175° C) about 12 to 14 minutes, or until baked in the centre.
10. Allow to cool and then cut into 24 equal pieces.

Some web sites and apps can do these calculations for you. Apps such as “My Fitness Pal” and “Cronometer” can analyze your recipes.

[1] Modified from Diabetes Canada Recipe “Chocolate Chip Cookie Bars.”

Terms

Basal – Your background insulin, either long acting or intermediate acting insulin.

Bolus – Your mealtime or rapid acting insulin.

Correction scale – A graduated scale telling you how much insulin to take to correct a certain level of blood sugar.

g – Grams. A metric unit of measuring the weight of something.

ICR – **i**nsulin to **c**arbohydrate **r**atio. Tells you how much one unit of rapid insulin will cover for the carbohydrates eaten. For example, if you need 1 unit of rapid insulin to cover 15 grams of carbohydrates, your ICR is 1:15.

ISF – **i**nsulin **s**ensitivity **f**actor (correction factor). Tells you how much one unit of rapid insulin will lower the blood sugar. For example, if you need 1 unit of rapid insulin to drop the blood sugar by 3 mmol/L, your ISF is 1:3.

Intermediate-acting insulin – Insulin that lasts up to 18 hours.
Current examples include Humulin® N and Novolin® NPH

Long-acting insulin – Insulin that last a long time, often lasting 24 hours or more.
Current examples are Basaglar®, Lantus®, Levemir®, Toujeo®, and Tresiba®.

mmol/L – Millimoles per litre. The number of molecules of glucose in one litre of blood.

Rapid-acting insulin – Insulin that usually works within 10 to 15 minutes after you inject it.
Current examples are Apidra®, Fiasp®, Admelog® and Trurapi®.

Resources available online at patienteduc.fraserhealth.ca

Carbohydrate Choices handout

Carbohydrate Counting – Resources handout

Carbohydrate Counting Daily Worksheet

On the Road to Diabetes Health booklet

Steps for Matching Rapid-Insulin to Carbohydrate Intake

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To order, visit patienteduc.fraserhealth.ca

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