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Carbohydrate Counting For Persons with Diabetes

About This Kit

This kit focuses on basic carbohydrate counting. Remember that this kit and the Lifestyle Management and Cardiovascular Risk Reduction Program are meant to complement, but not substitute, your physician's advice. If you have any questions, ask your mentor. The information in this kit is from the following websites: www.diabetes.ca and www.diabete.qc.ca.

Step 1. Carbohydrate counting
Step 2. The Glycemic Index
Step 3. Reading labels

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Step 1

Carbohydrate Counting
(Basic Counting Method)

The single nutritional factor which has the greatest impact on blood glucose is the total carbohydrate consumed during a meal or snack. It is important for people with diabetes to know the carbohydrate-rich foods and their carbohydrate content. In order to count carbohydrates, you must understand a variety of concepts and develop skills that range from the most basic to the most complex. This kit presents the basic counting method.

Carbohydrates are the body's main source of energy or calories. They are converted into glucose, a type of sugar, before being absorbed and used by the body. Carbohydrate consumption causes the pancreas to secrete insulin. The insulin then allows the body's cells to receive glucose. Insulin serves as a key to help glucose enter the cells, where it will be used as a source of energy. This migration of glucose into the cells helps in maintaining normal glucose levels.

In people with diabetes, the consumption of carbohydrates raises blood glucose levels above the normal range. The lack of insulin and the cells' resistance to insulin can explain this abnormality.

Therefore, in order to control their blood sugar, people with diabetes must monitor their carbohydrate intake and the time of day when carbohydrates are eaten. They must also be physically active and take anti-diabetic drugs (as prescribed).

There are two main types of carbohydrates: simple carbohydrates (sugars) and complex carbohydrates (starches). To control your blood glucose levels, you need to consider the total amount of carbohydrate you consume at each meal and snack. However, there are important reasons to avoid sugars. Sweet foods such as sugar, regular soft drinks, desserts, candies, jam and honey contain a lot of calories and generally few nutrients. The more you eat of them, the higher your blood glucose levels will be. Lowering your intake of sugar can help manage your weight, lower your triglyceride levels and increase your "good" cholesterol (HDL). If you choose to eat sugar, reduce the other sources of carbohydrate in your meal. You can use artificial sugars if you like.

One method of teaching, which involves the use of use of sugar squares, helps in visualizing the carbohydrate content of each of the food groups. This way, you can easily determine which foods contain the most carbohydrate and have a greater impact on your blood glucose. Each sugar square ■ represents 1 teaspoon of sugar or 5 g of carbohydrate. Carbohydrates are found in many foods, including starches (cereals, breads and other grain products). The *Diabetes Food Guide To Healthy Eating* divides the foods into six categories, three of which contain more carbohydrates (grains and starches, fruits, and milk and alternatives). One choice from these carbohydrate-rich foods provides about 15 g of carbohydrate (3 ■).

Food groups	**Amount**	**Number of ■s**	**Amount of carbohydrate**
Grains and starches	1 choice	■■■	0.5 oz. (15 g)
Fruits	1 choice	■■■	0.5 oz. (15 g)
Milk and alternatives	1 cup (250mL)	■■■	0.5 oz. (15 g)
Vegetables	*	minimal	minimal
Meat and alternatives	1 oz. (30 g)	none	0 oz. (g)
Fats and oils	1 tsp (5mL)	none	0 oz. (g)

* Usually an unlimited amount of vegetables is allowed since they are low in carbohydrate and calories.

The amount of carbohydrate (and calories) needed each day depends on various factors such as age, body size, weight and level of physical activity. Most people need 45 to 75 g (9 to 15 ■) of carbohydrate per meal and, if applicable, 15 to 30 g (3 to 6 ■) of carbohydrate per snack. A list of snacks containing 15 g of carbohydrate is provided at the end of this section.

At each meal or snack, decide on the number of grams of carbohydrate or choices in the carbohydrate-rich foods you want to eat. You can have the same number of carbohydrates at each meal or vary the distribution over the course of the day. For example, if your goal is to eat 14 carbohydrate choices (210 g) a day, you could eat 4 choices (60 g) at each meal and 2 choices (30 g) at each snack. Another option would be to eat 5 choices (75 g) at breakfast, 4 choices (60 g) at lunch and 5 choices (75 g) at supper.

Example:

	Number of carbohydrate-rich food choices		
Breakfast	4	5	3
Snack	1	0	1
Lunch	4	4	5
Snack	1	0	0
Supper	4	5	5
Total carbohydrate-rich food choices	14	14	14
Total grams of carbohydrate	210 g	210 g	210 g

Try to eat more or less the same amount of carbohydrate at each meal, day after day. Pick carbohydrates from the three food groups that include carbohydrates (grains and starches, fruits, and milk and alternatives) for a varied and balanced diet. Practise counting carbohydrates by completing the exercises on the "homework" page at the end of this kit. If you are under intensive insulin therapy, it may be helpful to know the amount of carbohydrate you expect to consume during a meal so that you can better determine the adjustments to be made to your insulin dose.

By eating a carbohydrate-rich food with other protein-rich foods, fats and dietary fibre, you can delay carbohydrate absorption and minimize the effect on your glucose levels.

Step 2

The Glycemic Index

The Glycemic Index (GI) is a scale that ranks carbohydrate-rich foods by how much they raise blood glucose levels compared to a standard food. The standard food is glucose or white bread.

For years, people believed that equal portions of different carbohydrates generated the same blood glucose levels (glycemic responses). As of the mid 1970s, Crapo, a Californian researcher from Stanford University, discovered evidence that carbohydrates having the same pure carbohydrate content did not necessarily have the same effect on blood glucose levels. Crapo established that a carbohydrate's potential to raise blood glucose levels and how it rates in comparison to other carbohydrates is what needs to be considered.

Replacing high GI foods with low GI foods in mixed meals helps control the immediate glycemic response in people with type 1 or type 2 diabetes. Eating low GI foods helps optimize glycemic control in people with diabetes. Generally speaking, if a carbohydrate-rich diet includes foods with a high GI, refined carbohydrates and little fibre, it can be harmful, but if it is based on foods with a low GI, it can be beneficial.

Here are a few suggestions to help lower the GI in your diet:

- Enjoy high-fibre cereals and starches as well as fruits and low-fat milk products with your meals. These are carbohydrate-rich foods that usually have a low GI.
- Eat a wide variety of vegetables.
- Plan meals by mainly choosing foods with a low or medium GI (see following list).
- Choose low GI foods such as barley, bulgar, couscous and lentils.
- Consult a dietitian for help in choosing low GI foods and adapting recipes, and to discover other ways to incorporate low GI foods in your meal plan.

The Glycemic Index

Low GI (55 or less) Choose most often	Medium GI (56–69) Choose more often	High GI (70 or more) Choose less often
BREADS: 100% stone ground whole wheat Heavy mixed grains Pumpernickel	**BREADS:** Whole wheat Rye Pita	**BREADS:** White bread Kaiser roll Bagel, white
GRAINS: All-Bran™ All-Bran Buds™ with psyllium Oatmeal Oat Bran™	**GRAINS:** Grape-nuts™ Shredded Wheat™ Quick oats	**GRAINS:** Bran flakes Corn flakes Rice Krispies™ Cheerios™
GRAINS: Parboiled or converted rice Barley/bulgar Pasta/noodles	**GRAINS:** Basmati rice Brown rice Couscous	**GRAINS:** Round-grain rice
OTHER: Sweet potato Yam Legumes Lentils Chickpeas Kidney beans Split peas Soy beans Baked beans	**OTHER:** Potatoes, new/white Sweet corn Popcorn Stoned Wheat Thins™ Ryvita™ (rye crisps) Black bean soup Pea soup	**OTHER:** Potato, baking (Russet) French fries Pretzels Rice cakes Crackers

Source: Canadian Diabetes Association, www.diabetes.ca

Step 3

Reading Labels

Nutrition Facts

Serving Size 1 ounce Servings in bag 4

Amount Per Serving

Calories 155 Calories from Fat 93

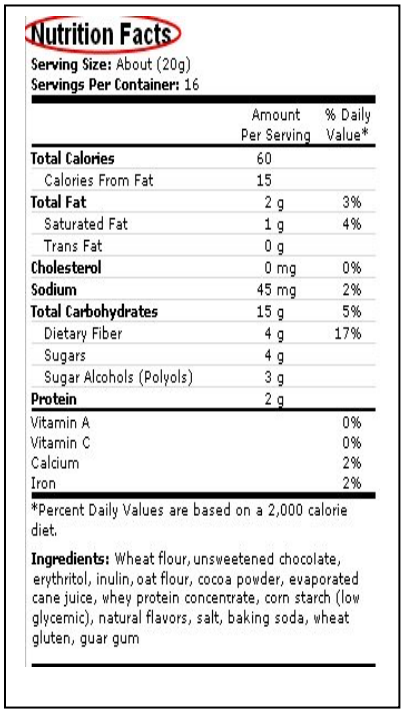
% Daily Value*

Total Fat 11g	16%
Saturated Fat 3g	15%
Trans Fat	
Cholesterol 0mg	0%
Sodium 148mg	6%
Total Carbohydrate 14g	5%
Dietary Fiber 1g	5%
Sugars 1g	
Protein 2g	

Vitamin A	0%	• Vitamin C	9%
Calcium	1%	• Iron	3%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

For basic carbohydrate counting, you will also use the information on the "nutrition facts" label on grocery store foods. In addition to the information in this kit, we recommend that you refer to the *Reading a Food Label* kit (Nutrition Kit 3). When reading the label, you should pay particular attention to the total amount of carbohydrate, which is 14 g in this example. The amount is given in grams and it includes fibres, sugars and starch. In this example there are 1 g fibre, 1 g sugar, and 14 g carbohydrate. These amounts are indented because they are included in the total number of grams of carbohydrate. You do not need to take into account the number of grams of sugars and fibre (indented) when counting carbohydrates. Note that fibre is not digested or converted into glucose to produce energy. However, carbohydrates from fibre do not raise your blood glucose levels. If a pre-packaged food contains a total of 5 g or more of fibre per portion, this amount is subtracted from the total carbohydrate in grams indicated in the Nutrition Facts table. In this example, the food contains 14 g of carbohydrate and 1 g of fibre in total. Therefore, you would be eating 13 g of carbohydrate (14-1=13g).



Nutrition Facts

Serving Size: About (20g)
Servings Per Container: 16

	Amount Per Serving	% Daily Value*
Total Calories	60	
Calories From Fat	15	
Total Fat	2 g	3%
Saturated Fat	1 g	4%
Trans Fat	0 g	
Cholesterol	0 mg	0%
Sodium	45 mg	2%
Total Carbohydrates	15 g	5%
Dietary Fiber	4 g	17%
Sugars	4 g	
Sugar Alcohols (Polyols)	3 g	
Protein	2 g	
Vitamin A		0%
Vitamin C		0%
Calcium		2%
Iron		2%

*Percent Daily Values are based on a 2,000 calorie diet.

Ingredients: Wheat flour, unsweetened chocolate, erythritol, inulin, oat flour, cocoa powder, evaporated cane juice, whey protein concentrate, corn starch (low glycemic), natural flavors, salt, baking soda, wheat gluten, guar gum

Occasionally a food label will have "polyalcohol" or "polyol," indented, under carbohydrates. These are neither sugars nor alcohols. This is a group of carbohydrates with a lower caloric value than other carbohydrates, because they are only partially absorbed by the body. They also raise blood glucose more slowly than sugar. Polyalcohols contain two calories per gram compared to four calories per gram for other carbohydrates. Polyalcohols and polyols are sweeteners used by food manufacturers to replace sugars and fats. The names of polyalcohols are easy to recognize in the ingredient list because most of them end in "ol" ("Polyols" in this example). If all of the carbohydrates in a food are polyalcohols and the food has less than 10 g per portion, you can conclude that the food's carbohydrates provide no energy value. Moreover, if the food has 10 g or more of polyalcohol, you must subtract half of the grams of polyalcohol from the total amount of carbohydrate to get the remaining grams of carbohydrate. For example, if a food contains 34 g of carbohydrate in total, including 6 g of fibre, 10 g of sugar

and 10 g of polyalcohol, consider this 23 g of carbohydrate, that is, a total of 34 g minus 6 g of fibre and 5 g of polyalcohol.

There are some sweeteners and artificial sugars that do not raise blood glucose levels. Health Canada has approved the following sweeteners, among others, as safe if taken in amounts up to the Acceptable Daily Intake (ADI): acesulfame potassium (Ace-K), aspartame, cyclamate, saccharin and sucralose. Note that cyclamate and saccharin should be avoided during pregnancy. More information on sweeteners can be found at www.diabetes.ca.

The basic carbohydrate counting method involves calculating the choices of carbohydrate-rich foods and the number of grams of carbohydrate consumed during a meal or snack. One choice from the carbohydrate-rich foods (foods from the grains and starches, fruits, and milk and alternatives groups) provides around 15 g of carbohydrate, or three sugar squares.

If a food product has a label:

1) Check the label to find out how many grams of carbohydrate it contains.
2) Divide the number of grams of carbohydrate by 15 to convert the grams of carbohydrate into choices.

If there is no food label:

1) Determine the number of carbohydrate-rich food choices based on the portion size using the recommendations in *The Diabetes Food Guide To Healthy Eating.*
2) Conversely, multiply the number of choices by 15 to determine the number of grams of carbohydrate.

Use one of these two methods to determine the total choices of carbohydrate-rich foods or grams of carbohydrate eaten at each meal or snack.

Examples of snacks that contain 15 g of carbohydrate

FOOD	AMOUNT
Medium fresh fruit	1
Medium apple with 1 oz of nuts	1
Unsweetened applesauce	1/2 cup (125 mL)
Fruit salad, no sugar added	1/2 cup (125 mL)
Low Fat (Skim) yogurt, no sugar added	3/4 cup (180 mL)
Low-fat milk	1 cup (250 mL)
Low-fat popcorn	3 cups (750 mL)
Arrowroot or ginger cookies	3–4 cookies
Soda crackers with 2 tbsp (30 mL) peanut butter	7
Rice cakes with 1 oz (30 g) low-fat cheese	2

If you are having a snack, choose a healthy food. Limit your intake of sweets and chips because they are very low in nutrients. They contain little in terms of vitamins, minerals and dietary fibre. Even a small amount of sweets will limit the total amount of carbohydrate for the rest of the day. Add protein and choose foods high in fibre to slow carbohydrate absorption and minimize the impact on your blood glucose levels. There are many other healthy snack choices that contain few or no carbohydrates, such as raw vegetables with hummus, or a small handful of almonds or nuts (1/4 cup or 60 mL).

Carbohydrate Counting for Persons with Diabetes

Before Your Next Visit

In the time between visits with your mentor, you should read and complete your educational kits. Use this sheet to record your work. Think of this as "homework."

- ❑ Complete the sentences in the Check Yourself section to ensure that you have a good understanding of the key concepts in this kit.

Check Yourself

1. Calculate the number of grams of carbohydrate and the corresponding number of choices in this breakfast:

Foods	Grams of carbohydrate according to the label	Number of choices*
3/4 cup Cheerios™ (180mL)	The label on the box states that a 3/4 cup (180mL) serving equals 24 g carbohydrate.	*The Diabetes Food Guide To Healthy Eating* shows that 1/2 cup (125mL) of cold cereal equals 1 choice in the grains and starches category. Since 3/4 cup (180mL) is 50% more, it counts as 1.5 choices.
1 cup milk 1% MF (250mL)	The label indicates that 1 cup (250mL) of milk provides 12 g carbohydrate.	One cup of milk equals 1 choice.
1 slice whole wheat bread (1 oz) (28g)	The label indicates that 2 slices equal 1 oz (28g). Since we only have one slice, it provides only 10 g carbohydrate.	One slice of whole wheat bread equals 1 choice.
1 tbsp peanut butter (15mL)	The label indicates that one 1 tbsp (15mL) portion provides 3 g carbohydrate.	The Guide classifies peanut butter in the meat and alternatives group. Therefore, this equals 0 choices.
1 orange	One orange equals approximately 15 g of carbohydrate.	The Guide states that one medium-sized orange represents 1 choice.
1 coffee, black	0 g carbohydrate	0 g
Total carbohydrate	**64 g**	**4.5 choices (or 4.5 x 15 g = 67.5 g)**

* Estimate of the number of choices from carbohydrate-rich foods according to *The Diabetes Food Guide To Healthy Eating*

2. Calculate the number of grams of carbohydrate and the corresponding number of 15 g choices in the following meal (based on *The Diabetes Food Guide To Healthy Eating*):

- Chicken sandwich: 2 slices whole wheat bread
  1 tsp margarine
  2 slices tomato and 1 lettuce leaf
  Chicken (1 oz or 28g)
  Sliced cheese (1 oz or28g)

- 1 glass of milk (1 cup or 250 ml)

- 1/2 cup (125 ml) baby carrots

- 1 medium apple

Food	Portion	Grams of carbohydrate	Number of choices of carbohydrate-rich foods
1) Whole wheat bread	2 slices		
2) Margarine	1 tsp (5mL)		
3) Tomato	2 slices		
4) Lettuce	1 leaf		
5) Chicken	1 oz (28g)		
6) Sliced cheese	1 oz (28g)		
7) Glass of milk	1 cup (250 mL)		
8) Baby carrots	1/2 cup (125 mL)		
9) Medium apple	1 medium		
10) Total:			

Answers: 1) 30 g = 2 choices; 2) 0 g = 0 choices; 3) 0 g = 0 choices; 4) 0 g = 0 choices; 5) 0 g = 0 choices; 6) 0 g = 0 choices; 7) 15 g = 1 choice; 8) 5 g = 0 choices; 9) 15 g = 1 choice; 10) Total: 65 g = 4 choices