

Physical Activity Guidelines for Students with Diabetes

Overview

- Physical activity usually **lowers** blood glucose. The drop in blood glucose may be immediate or delayed as much as 12-24 hours.
- The child may need fast-acting carbohydrates **without insulin coverage** for every 30-45 minutes of vigorous physical activity. This amount may need to be adjusted later after seeing the effect on blood glucose.
- Blood glucose should be tested before exercise and every 30-45 minutes while exercising.
- **Do not** exercise if blood glucose is <70 (6 and older) or <80 (5 and younger) or >240 mg/dL and moderate or large ketones are present.
- **Do not** give a high blood glucose correction bolus after activity as the blood glucose level will likely decrease on its own within 2-3 hours.

Suggested Recommendations for Carbohydrate Intake During Exercise to Avoid Hypoglycemia

For patients on insulin pumps, we recommend suspending or, briefly disconnecting, the insulin pump during times of physical activity.

Type of Activity	Blood Glucose	Amount of Carbohydrate for Every 30-45 Minutes of Activity
Low/Light Intensity or Short Duration (30 minutes or less) Slower walk, leisurely bike ride During activity can easily talk or sing	80-100 mg/dl	5-10 grams
	100-300 mg/dl	None
Moderate Intensity and Duration (30 minutes to 1 hour) Faster walk, tennis, jogging During activity can talk in short phrases	80-100 mg/dl	10-15 grams
	100-180 mg/dl	5-10 grams
	180-300 mg/dl	None
Vigorous/Strenuous (60 minutes or more) Running, swimming, basketball During activity can have difficulty talking easily	80-100 mg/dl	15-25 grams
	100-180 mg/dl	15-25 grams
	180-300 mg/dl	5-10 grams



Carbohydrate Counting and Diabetes

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WHAT IS CARBOHYDRATE COUNTING?

Carbohydrate counting is a meal planning method people with diabetes use to help control their blood glucose. Carbohydrates provide energy for your body and is the nutrient in food that affects blood glucose the most. It is known that the majority of the carbohydrates you eat turn to glucose in your body.

Foods with carbohydrates give you energy, help you grow, and provide important nutrients. Do not avoid or restrict carbohydrate foods. It's recommended carbohydrates should come from healthy carbohydrate foods. Foods with added sugars such as dessert can still be eaten but in moderation. Read on to find out which foods are healthy carbohydrate foods.

WHAT FOODS HAVE CARBOHYDRATES?

Many foods you eat during the day have carbohydrates. Foods with starch and sugar have carbohydrates. Starch is found in a variety of foods such as bread, pasta, rice, cereal, beans and starchy vegetables. Natural sugar is found in fruits, milk products and vegetables. Sugars are added in dessert, candy, regular soda pop, pre-sweetened cereal, syrup, etc.

HOW MANY CARBOHYDRATES ARE IN FOODS?

The table on the following page gives an estimate of the amount of carbohydrates in different foods. It is best to get the carbohydrate information from the food label, but this table can be used to estimate the carbohydrate content if you do not have the food label. We recommend you count carbohydrates in all foods, including those with small amounts of carbohydrates.

CARBOHYDRATE COUNTING RESOURCES

The Calorie King, Fat & Carbohydrate Counter, by Allan Borushek
calorieking.com
fastfood.com
nal.usda.gov/fnic/foodcomp/search/
nutritiondata.self.com

Carbohydrate Counting and Diabetes

Foods Containing Carbohydrates	Serving Sizes = 15 Grams of Carbohydrates
Grains/beans/starchy vegetables	1/2 to 3/4 cup cereal, 1/3 cup rice or pasta (cooked), 1 slice bread, 1/2 cup starchy vegetables: corn, potatoes, peas
Fruit	1 small piece fresh fruit, 1/2 cup juice-packed or lite canned or frozen fruit
Milk/yogurt	8 oz milk, 6 oz plain or lite yogurt
Sweets, desserts & other carbohydrates	1/2 cup ice cream, 2 small cookies, 1 pkg fruit snacks
Foods Containing Carbohydrates	Serving Sizes = 5 Grams of Carbohydrates
Nonstarchy vegetables (broccoli, carrots, cauliflower, green beans, salad, etc.)	1/2 cup cooked vegetables, 1 cup raw vegetables
Foods Containing Carbohydrates	Serving Sizes = 0-5 Grams of Carbohydrates
Meat/meat substitutes	1-3 oz meat, fish, poultry, eggs, cheese, peanut butter (1 Tbsp peanut butter)
Fat	1 tsp butter, margarine, oil, 1 Tbsp salad dressing
Sugar-free foods/condiments	Sugar free gelatin, sugar substitutes, seasonings, sugar-free drinks

WHAT ABOUT PROTEIN AND FAT?

Protein foods usually have little or no carbohydrates. Protein is important for growth and repair of cells (muscles, organs, skin), a healthy immune system, and to help with wound healing. Protein has little to no effect on blood glucose. Some protein may turn to glucose in the body, but it may take a few hours to enter the bloodstream.

Fat foods usually have little or no carbohydrates. Fat is important to help cushion and protect body organs and bones and helps your body feel full. Fat has little to no effect on blood glucose. High-fat meals can slow down the absorption of carbohydrates, which may cause a high blood glucose several hours after the meal. A high-fat diet is also linked to unwanted weight gain and heart disease; therefore, it is recommended to eat a healthy well-balanced diet.

Carbohydrate Counting and Diabetes

WHAT ABOUT READING FOOD LABELS?

The best way to know how many carbohydrates are in the food you eat is to look at the label on the package. The main things to look for on the food label include:

- Serving Size
- Total Carbohydrate

Serving size is listed as a measurement, such as cup or 1 ounce. All of the information on the label is based on the serving size that is listed. You may eat more or less than the serving listed, so you may need to make adjustments based on how much you plan to eat.

Total carbohydrate is the total grams of carbohydrate in the serving size that is listed. Sugar grams are included in the carbohydrate grams, so you do not need to count the grams of sugar.

WHAT IS AN INSULIN TO CARBOHYDRATE RATIO?

It will be important for you to count carbohydrate grams in the food you plan to eat at meals and snacks and then give insulin based on this amount of carbohydrate—this is called using an insulin to carbohydrate ratio. Using an insulin to carbohydrate ratio means that you will add up the grams of carbohydrate you plan to eat and divide it by a number (your insulin to carbohydrate ratio). The following shows an example of how to calculate how much insulin you need to take using an insulin to carbohydrate ratio.

Using an Insulin to Carbohydrate Ratio

Ratio: 1:15 (1 unit of rapid-acting insulin for every 15 grams of carbohydrate)

Breakfast

3/4 cup Cheerios	17 grams
1 cup skim milk	11 grams
1 slice whole wheat	12 grams
1 tsp. butter	0 grams
17 small grapes	15 grams
	55 grams of carbohydrate

Calculation

$$55 \div 15 = 3.7$$

ANSWER:

If on half unit insulin pens: round down to 3.5 units of insulin. If on full unit insulin pens: round up to 4 units of insulin.

Nutrition Facts	
Serving Size 1/2 cup (114g)	
Servings Per Container 4	
Amount Per Serving	
Calories 90	Calories from Fat 30
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80%	Vitamin C 60%
Calcium 4%	Iron 4%

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

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Note: the Nutrition Facts Labels are in the process of changing. Serving Size will be listed underneath Servings Per Container so be sure to read the new labels closely.



Carbohydrate Counting and Diabetes

IS HEALTHY EATING IMPORTANT?

Healthy eating benefits all, even those in the family who do not have diabetes. If the child with diabetes is the only person in the home expected to make healthy food choices, diabetes can be more difficult to manage. If everyone at home is working on healthy eating, the child with diabetes is less likely to feel singled out, less likely to sneak foods, and less likely to binge or overeat.

Being a good role model is a good place to start when trying to make healthier food choices. Parents who eat healthy are providing an example for the watchful eyes of their children. Children tend to prefer foods their parents eat. Exposure to a wide variety of foods over a period of time increases the likelihood that these foods will be accepted and enjoyed by kids. Use the MyPlate Food Guidance System (www.choosemyplate.gov) to help you guide your choices to healthy eating.

WHAT ARE HEALTHY CARBOHYDRATES?

Healthy carbohydrates include foods with high-nutrient density. High nutrient dense foods have substantial amounts of vitamins, minerals, and fiber, and relatively few calories. High nutrient dense foods include fruits, vegetables, low-fat dairy and whole grains. Low-nutrient dense foods do not have substantial amounts of vitamins, minerals, and fiber, and are often high in calories. Low nutrient dense foods include things such as chips, cookies, granola bars and crackers. Choosing high nutrient dense foods most often helps provide adequate energy, growth and development. Choosing these foods most often will also help provide long-term health benefits such as weight control and decreased risk for heart disease.

CARBOHYDRATE COUNTING AND USE OF INSULIN TO CARBOHYDRATE RATIOS AT SCHOOL:

1. Children from the Children's Mercy Diabetes Center will be counting grams of carbohydrate in foods.
2. Most children will use an insulin to carbohydrate ratio which will provide 1 unit of rapid-acting insulin for a certain number of grams of carbohydrate; for example: 1 unit of Humalog insulin for each 15 grams of carbohydrate food the child plans to eat. Ratios will be specific for each individual and may differ for each meal and snack.
3. Extra carbohydrates *MAY* be needed for extra activity (about 15 grams of carbohydrate for every 30-45 minutes of vigorous activity).
4. Food should not be omitted for blood glucose readings that are high unless you are acting under the guidance of the parent.
5. Provide the student with school menus which include the portion sizes. Contact the school district's food service director for carbohydrate information on school foods.



Frequently Asked Questions About Nutrition and Diabetes in School

WHERE DO I FIND CARBOHYDRATE INFORMATION ABOUT FOOD?

ANSWER: The best place to start is the school district website. If it is not available on the website, contact the Food Service Director of your school district. Ask for carbohydrate information based on menu portions. They usually have printed information they can give you about foods served in school. You can also purchase a carbohydrate counting book, and/or use websites. See the Diabetes Resource List.

TRUE OR FALSE? YES OR NO?

- **When counting carbohydrates in school lunches, just count the big stuff like hamburgers and fries and not the little stuff like ketchup.**
ANSWER: FALSE - It is important to count carbohydrates in everything that is eaten. Some students may use a lot of ketchup which could make a difference in their insulin dose if they don't count it. Insulin pumps give doses of insulin in tenths of a unit so precision is important.
- **It's okay for students to take their insulin after they eat if they are not sure how much they are going to eat.**
ANSWER: FALSE - School-age students are predictable eaters so they should dose before they eat unless indicated otherwise in school orders or acting under the guidance of the parent.
- **Blood glucose will be higher after the meal when insulin is dosed after eating. If a student is trying a new food they may not like, then dosing after they eat may be reasonable.**
ANSWER: TRUE - Some very young children who are unpredictable eaters are allowed to dose after eating.
- **A student wants to go back for seconds. Does he/she need more insulin?**
ANSWER: YES - The student may have more to eat if he/she counts the carbohydrates in the food and takes more insulin for it. Insulin for the seconds can be given after eating.
- **Does a student always need a snack before PE to prevent their blood glucose from dropping too low?**
ANSWER: NO - We tell students as a general rule to eat 15 grams of carbohydrate for every 30 to 45 minutes of activity they do. However, many variables exist such as the duration and intensity of the gym activity. The blood glucoses will determine if they really need a snack and how much of a snack. See the handout, Physical Activity Guidelines for Students with Diabetes.



Frequently Asked Questions About Nutrition and Diabetes in School

- **A student unexpectedly brings in cake and ice cream for their birthday to celebrate with their class. Can the student with diabetes have cake and ice cream since they contain sugar?**
ANSWER: YES - The student should count carbohydrates in the cake and ice cream and dose insulin based on their insulin to carbohydrate ratio (ex. -1 unit per 15 grams of carbohydrate). Sweets in moderation are okay unless otherwise indicated in student's orders. Insulin is based on total carbohydrate eaten. Sugar-free versions of cake and ice cream are not necessary. See the handout, Foods for Occasional Use, for estimates of carbohydrate in cake, cookies and candy.
- **Are there any foods or beverages not recommended for a student with diabetes?**
ANSWER: YES - The only food not recommended for a student with diabetes is sugar in liquid form (except when treating a low blood sugar) such as regular pop, regular Kool-Aid, fruit juice or punch, Gatorade, etc. Even when insulin is given for these beverages, blood glucose goes higher more rapidly. Chocolate milk at school is acceptable, since it contributes important nutrients (protein, calcium, Vitamin D): and affects blood glucose like food.



Using an Insulin to Carbohydrate Ratio at School

- Check the carbohydrate gram information for the foods the student plans to eat for the meal.
- Total the grams of carbohydrate for the foods.
- Divide by the Student's Insulin to Carbohydrate Ratio.
- Student or RN check blood glucose.
- Student or RN dose insulin before the meal or as recommended.

Sean plans to eat all the following for his school breakfast and plans to drink white milk. Sean uses a ratio of 1 unit per 12 grams carbohydrate.

Breakfast Menu

Breakfast Pizza 1 slice—23g Carbohydrate

2% Milk (8 oz) White—11g or 2% Milk (8 oz) Chocolate—26g

Breakfast Carbohydrate Grams: 34g

Insulin Dose: Total grams = 34g ÷ Ratio (12) = 2.8 = 3 units

Sara plans to have the following lunch but states she does not like green beans or mustard. She wants 2 packages of ketchup and wants chocolate milk with her meal. Sara uses a ratio of 1 unit per 15 grams carbohydrate.

Lunch Menu

Hamburger on bun—24g Carbohydrate

French Fries 3 oz —26g Carbohydrate

Green Beans 1/2 cup—3g Carbohydrate

Ketchup (1 pkg)/Mustard (1 pkg) /2 pickle slices—2g/0g/0g Carbohydrate

Peaches 1/2 cup —20g Carbohydrate

2% Milk (8 oz) White—11g or 2% Milk (8oz) Chocolate—26g Carbohydrate

Lunch Carbohydrate Grams: 100g

Insulin Dose: Total grams = 100g ÷ Ratio (15) = 6.6 (round to 6.5 or 7 units)



Diabetes Center Terminology for Schools

Term	Definition	Abbreviation
Blood glucose	Also called blood sugar, measured in mg/dl.	BG
Blood glucose target range	Acceptable blood glucose range. Individual goal for blood glucose.	Before meals: 70-130 mg/dL After meals: <180 mg/dL
Carbohydrate bolus	Insulin given to cover carbohydrate intake.	Bolus
Carbohydrate ratio	Formula used to match insulin to carbohydrates. Based on how many grams of carbohydrates will be covered by 1 unit of insulin.	Ratio
Carbohydrates	Nutrient that provides the main source of energy to the body and has the greatest effect on blood glucose levels.	Carbs
Correction bolus	Amount of insulin given to cover high blood glucose.	
Correction factor/insulin sensitivity factor	Formula used to correct high blood glucose. Based on how much 1 unit of insulin will lower the blood glucose.	correction factor/ISF

Diabetes Center Terminology for School

Term	Definition	Abbreviation
Correction Target	Target blood glucose value used in insulin dose calculations.	
Hemoglobin A1c	Also called glycosylated hemoglobin. Lab test that provides a three-month average of blood glucose.	HgbA1c or HbA1c or A1c
Insulin glargine (Lantus) Insulin detemir (Levemir)	Long-acting insulin Long-acting insulin	
Insulin lispro (Humalog) Insulin aspart (Novolog) Insulin glulisine (Apidra)	Rapid-acting insulin Rapid-acting insulin Rapid-acting insulin	
Multiple Daily Injections	Type of insulin therapy where rapid-acting insulin is used for high blood glucose and food; long-acting insulin is used as basal insulin	MDI
Insulin Pump Therapy	Type of insulin therapy using a mechanical device that delivers rapid-acting insulin to cover food, high blood glucose, and basal insulin requirements	Pump
Metformin	Oral medication for type 2 diabetes or insulin resistance.	Generic: Glucophage
Type 1 diabetes	Requires insulin therapy. Previously referred to as Juvenile Diabetes. Condition of insulin deficiency.	
Type 2 diabetes	Treatment may require diet, exercise, insulin therapy and/or oral medications. Condition of insulin resistance.	