



# Section 7: Nutrition for Students with Diabetes

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## SECTION OVERVIEW

- General Overview
  - Nutrients Found in Food
  - Daily Calorie Needs
  - MyPyramid for Kids
  - Carbohydrates and Carbohydrate Counting
  - Insulin-to-Carbohydrate Ratio
  - Healthy Snacks
  - Portion Control and the Plate Method
  - Nutrition Labels
  - Healthy Weight Management
  - Cholesterol
  - School Parties and Special Occasions
  - School Lunch Accommodations
- .....

## General Overview

The United States 2005 Dietary Guidelines describe a healthy diet as one that promotes fruits, vegetables, whole grains, and nonfat or low-fat milk or dairy products. A healthy diet is also low in saturated fat, cholesterol, salt (sodium), added sugars, and minimal amounts of trans fat.

Proper nutrition can help ensure adequate vitamin and mineral intake, essential for healthy growth and development of all children and adolescents. A poor diet and inactive lifestyle are major causes of health problems and death in the United States. Specific diseases and health problems linked to poor diet can include:

- |  |                           |
|--|---------------------------|
| ■ High blood pressure (hypertension)               | ■ Digestive disease       |
| ■ High cholesterol or triglycerides (dyslipidemia) | ■ Iron-deficiency anemia  |
| ■ Type 2 diabetes                                  | ■ Oral disease            |
| ■ Overweight and obesity                           | ■ Malnutrition            |
| ■ Osteoporosis                                     | ■ Some cancers            |
| ■ Constipation                                     | ■ Low levels of Vitamin D |

## Section 7: Nutrition for Students with Diabetes

Schools are an ideal place for all students to learn and practice good nutrition; the classroom is a good place to start. Good nutrition helps students grow, learn, and succeed in school. Well-nourished children are known to have higher test scores, better school attendance, and fewer problems during school.

Healthy eating guidelines for students with diabetes must ensure adequate calories to promote growth and development, including a proper balance of food, insulin and/or medication, and physical activity to achieve optimal blood glucose control.

Healthy food choices are the foundation of diabetes management. There are no forbidden foods for students with diabetes. Special planning to balance good nutrition with treatments (insulin and/or medication) and physical activity allows students with diabetes to participate safely in any activity as students without diabetes. Nutrition recommendations for all students take into account the many factors that can impact eating habits and blood glucose management, including:

- Food preferences
- Cultural influences
- Family eating patterns and schedules
- Physical activity level
- Insulin activity time, type of insulin, and how quickly the insulin works
- Caloric needs based on weight and growth patterns
- Special diet and nutritional needs

### Nutrients Found in Food

Food is the main source of energy for the body. The three major nutrients found in food are: carbohydrates, proteins, and fats. Eating a balance of foods containing these three nutrients is important.

#### 1. Carbohydrates

- Supply the main energy and fuel for the body
- Assist with proper brain and organ function
- Food sources include:
  - Complex carbohydrate foods: breads, cereals, pasta, rice, and starchy vegetables (e.g., potatoes, peas, corn, and lima beans)
  - Simple carbohydrate foods: sugar, honey, syrup, candy, soft drinks, icings, fruits, milk, and fruit juice
- Carbohydrates break down quickly into sugar and are a quick source of energy for the body
- Carbohydrates produce a quick rise in blood glucose levels
- Whole grain carbohydrates are a good fiber source

#### 2. Proteins

- Build and repair body tissues
- Help fight infection
- Promote normal growth and development

## Section 7: Nutrition for Students with Diabetes

- Provide a feeling of fullness and satisfaction
- Food sources include: meat, poultry, fish, eggs, milk, yogurt, cheese, dried beans and peas, nuts, and nut butters
- Proteins eaten as part of a meal may slow absorption of carbohydrates, producing a slower rise in blood glucose levels

### 3. Fats

- Supply a high calorie energy source for the body
- Assist with absorption of fat-soluble vitamins A, D, E, and K
- Provide a feeling of fullness and satisfaction
- Slow the time it takes food to empty from the stomach
- Food sources include: oils, shortening, butter, margarine, mayonnaise, salad dressings, table cream, and sour cream
- Fats eaten as part of a meal may slow absorption of carbohydrates, producing a slower rise in the blood glucose levels

## Daily Calorie Needs

In the United States, a “calorie” is defined as a unit of energy. Daily calorie needs vary from student to student. Requirements are based on the student’s usual intake and growth status. Table 11 provides estimated daily calorie needs for a student based on gender, age, and level of activity.

**Table 11: Estimated Daily Calorie Needs by Sex, Age, and Level of Activity**

	Calorie Range	
	Sedentary	Active
<b>Children</b> 2-3 years	1,000	1,400
<b>Females</b> 4-8 years	1,200	1,800
9-13 years	1,600	2,200
14-18 years	1,800	2,400
<b>Males</b> 4-8 years	1,400	2,000
9-13 years	1,800	2,600
14-18 years	2,200	3,200

Adopted from: United States Department of Agriculture, Center for Nutrition Policy and Promotion (2005). *Estimated Daily Calorie Needs*. Retrieved from: [http://mypyramid.gov/downloads/MyPyramid\\_Food\\_Intake\\_Patterns.pdf](http://mypyramid.gov/downloads/MyPyramid_Food_Intake_Patterns.pdf)

**Sedentary** means a lifestyle that includes only the light physical activity associated with typical day-to-day life.

**Active** means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.

## Section 7: Nutrition for Students with Diabetes

### MyPyramid for Kids

MyPyramid for Kids is a guide to healthy eating and physical activity developed by the United States Department of Agriculture. MyPyramid provides information and recommendations for a healthy, well-balanced diet tailored to the needs of children and adolescents. MyPyramid helps students identify what foods and how much food he or she should eat for optimal health. Table 12 provides the recommended daily amount of food from each food group, based on the number of calories consumed. More information on MyPyramid can be found at: [www.mypyramid.gov](http://www.mypyramid.gov). The “MyPyramid for Kids” is included in *Section 14: Tools*.

**Table 12: Daily Amount of Food from Each Food Group**

Calorie Level	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	3,200
Fruits	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups	2 cups	2 cups	2 cups	2.5 cups
Vegetables	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups	3 cups	3 cups	3.5 cups	4 cups
Grains	4 oz–eq	5 oz–eq	5 oz–eq	6 oz–eq	6 oz–eq	7 oz–eq	8 oz–eq	9 oz–eq	10 oz–eq
Meat & Beans	3 oz–eq	4 oz–eq	5 oz–eq	5 oz–eq	5.5 oz–eq	6 oz–eq	6.5 oz–eq	6.5 oz–eq	7 oz–eq
Milk	2 cups	2 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp	11 tsp
Discretionary calorie* allowance	171	171	132	195	267	290	362	410	648

Adopted from: United States Department of Agriculture, Center for Nutrition Policy and Promotion (2005). *Food Intake Patterns*. Retrieved from: [http://www.mypyramid.gov/downloads/MyPyramid\\_Food\\_Intake\\_Patterns.pdf](http://www.mypyramid.gov/downloads/MyPyramid_Food_Intake_Patterns.pdf).

eq means equivalent

\* Discretionary calories: “extra” calories that can be consumed in small amounts, but are not necessary for health or nutrition (e.g., butter and other solid fats, added sugars, alcohol, or more food from any group). Each calorie level has an allowance for some discretionary calories. These calories may be eliminated if weight loss is a goal.

## Section 7: Nutrition for Students with Diabetes

### Carbohydrates and Carbohydrate Counting

Carbohydrates are the body's main source of energy and have the greatest effect on blood glucose levels. Balancing the amount and the type/source of carbohydrate foods throughout the day is one key to controlling blood glucose levels. The amount of carbohydrates per meal is individualized, based on nutrition and weight goals, eating habits, and physical activity level. A registered dietitian assists students with diabetes in selecting a meal plan to help keep blood glucose in the goal range, including matching doses of insulin to carbohydrate content in each meal.

For a list of common foods and their carbohydrate content, refer to the tip sheet titled "Common Carbohydrate Servings and Amounts" in *Section 14: Tools*. Less healthy carbohydrate foods are high in sugar and/or fat and provide poor amounts of vitamins and minerals. Table 13 provides some examples of healthy and less healthy carbohydrate foods.

**Table 13: Healthy and Less Healthy Carbohydrate Foods**

Healthy Carbohydrate Foods	Less Healthy Carbohydrate Foods
<ul style="list-style-type: none"><li>▪ Whole grains</li><li>▪ Vegetables</li><li>▪ Fresh or naturally-sweetened fruits</li><li>▪ Dried beans</li><li>▪ Low-fat milk and dairy products</li></ul>	<ul style="list-style-type: none"><li>▪ Soda and juice/juice drinks</li><li>▪ Candy</li><li>▪ Fast foods</li><li>▪ Donuts</li><li>▪ Dessert</li><li>▪ Chips</li></ul>

Carbohydrate counting is the most common meal planning method. A meal plan typically suggests a specific number of carbohydrate servings or a specific number of grams of carbohydrates for each meal and snack.

<b>Carbohydrate</b> (Measured in grams)	<b>Also referred to as</b> 	<ul style="list-style-type: none"><li>▪ Carbs</li><li>▪ Carb</li><li>▪ Grams of carbohydrate</li></ul>
<b>Carbohydrate serving</b> (1 serving = about 15 grams of carbohydrate)	<b>Also referred to as</b> 	<ul style="list-style-type: none"><li>▪ Carbohydrate choice</li></ul>

Students commonly count carbohydrate grams, rather than servings. The Nutrition Facts food labels (required by law for most food products sold) can assist in determining the serving size and the amount of total carbohydrates (in grams) in one serving of food. Many younger students are not able to count carbohydrates; in these cases, the school must designate someone to assist.

Two common meal plans for students with diabetes are fixed and flexible. A fixed meal plan provides the same amount of carbohydrates at each meal and snack. A flexible meal plan provides the ability to vary the amount of carbohydrates at each meal and snack. The type of insulin regimen and overall weight and nutrition goals will determine the best meal plan for a student. For resources on carbohydrate counting, refer to *Section 15: Resources*.

## Section 7: Nutrition for Students with Diabetes

### Insulin-to-Carbohydrate Ratio

An insulin-to-carbohydrate ratio is used to determine the amount of insulin needed to match the amount of carbohydrate consumed at a meal or snack. Insulin-to-carbohydrate ratios are highly individualized and can change frequently. As students with diabetes grow, insulin needs increase. Younger students may have an insulin-to-carbohydrate ratio of 1:30 (1 unit of insulin for every 30 grams of carbohydrate) and older students may have an insulin-to-carbohydrate ratio of 1:5 (1 unit of insulin for every 5 grams of carbohydrate). The student's Diabetes Medical Management Plan (DMMP) will commonly indicate the insulin-to-carbohydrate ratio to be used during school. Two examples of an insulin-to-carbohydrate ratio for hot lunch are provided below.

#### Example: Hot Lunch Meal (using carbohydrate choices)

Note: for this particular student, the insulin-to-carbohydrate ratio is one unit of insulin for one carb choice (1:1).

Lunch includes:

- 1 slice wheat bread = 1 carb choice
- 3 slices turkey = 0 carb choice
- 1 cup chocolate milk = 2 carb choices
- Fruit cup = 1 carb choice

The total carbohydrate choices for lunch equal 4 carb choices (1 + 0 + 2 + 1).

This student's insulin-to-carbohydrate ratio is 1:1. The total insulin meal bolus is 4 units (4:4).

#### Example: Hot Lunch Meal (using grams of carbohydrate)

Note: for this particular student, the insulin-to-carbohydrate ratio is one unit of insulin for every 15 grams of carbohydrate (1:15).

Lunch includes:

- 1 slice wheat bread = 18 grams of carbohydrate
- 3 slices turkey = 2 grams of carbohydrate
- 1 cup chocolate milk = 28 grams of carbohydrate
- Fruit cup = 22 grams of carbohydrate

The total carbohydrate choices for lunch equal 70 grams (18 + 2 + 28 + 22).

This student's insulin-to-carbohydrate ratio is 1:15. The total insulin meal bolus is 4.7 units ( $70 \div 15 = 4.7$ ).

## Section 7: Nutrition for Students with Diabetes

### Healthy Snacks

Snacks often satisfy hunger between meals. Snacking on healthy food is an excellent way to get the required daily vitamins and minerals. For a list of healthy snack options, refer to the tool titled “Super Healthy Snacks” in *Section 14: Tools*.

Students with diabetes may require snacks between meals (mid-morning and/or mid-afternoon), during school, or during school-sponsored activities to help sustain blood glucose levels. Snacks between meals should be part of a student’s meal plan. Snacks are sometimes a parent’s/guardian’s preference. Snacks are commonly dependent upon the student’s insulin regimen, age, and/or physical activity level. Between-meal snacks that involve carbohydrate foods, especially if the carbohydrate amount is greater than 15 grams, may require insulin. A student’s Diabetes Medical Management Plan should document insulin coverage for snacks, including timing of snacks and snack alternatives in the case of unforeseen circumstances. On occasion, school personnel may need to monitor snack consumption of a student with diabetes.<sup>11</sup>

### Portion Control and the Plate Method

Portion control consists of eating a measured amount of food to promote healthy growth, weight, and balanced nutrition. Students with type 1 diabetes can use portion control to keep track of carbohydrate foods eaten and to count carbohydrates accurately. Students with type 2 diabetes can use portion control to reduce the amount of food eaten to promote or assist with weight loss/weight management.

The Plate Method is a tool used for meal planning that provides a healthy amount of carbohydrates, a lower fat intake, and an increased amount of fruits and vegetables. The tool provides a visual of how much space each type of food should occupy on a plate. This tool can assist some students with diabetes in controlling portion sizes and consuming an appropriate amount of all food groups. The Plate Method is easy to use and may be used in conjunction with other healthy eating tools to monitor carbohydrate intake, assess portion sizes, and assist with weight management for anyone interested in healthy eating.

A typical meal on a standard 9-inch plate includes:

- 1/2 plate: Non-starchy vegetables (e.g., salad, green beans, beets)
- 1/4 of plate: Whole grains or starchy vegetables (e.g., bread, rice, pasta, corn, peas, potatoes)
- 1/4 of plate: Lean meat or another form of lean protein

To the side of the plate:

- 1 small piece of fruit
- 1 cup milk, yogurt, or other low-fat dairy

For more on the Plate Method, refer to the Tip Sheet titled “Meal Planning with the Plate Method: Lunch/Dinner” in *Section 14: Tools*.

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<sup>11</sup> *Renton (WA) School Dist.*, Complaint No. 10-93-1079, 21 IDELR 859 (OCR 1994).

## Section 7: Nutrition for Students with Diabetes

### Nutrition Labels

The Nutrition Labeling and Education Act of 1990 required the majority of food packaging to include a “Nutrition Facts” label that provides information on serving size and number of servings per container. The label also includes information such as: calories, fat, saturated fat, trans fat, cholesterol, sodium, carbohydrates (including fiber and sugar), and protein. For information on how to read a food label, see “How to Use a Food Label to Select Foods” in *Section 14: Tools*.

### Healthy Weight Management

Overweight and obesity in children and adolescents is an increasing concern in Wisconsin, as well as across the United States. In general, overweight and obesity leads to higher risk of premature death, type 2 diabetes, high blood pressure (hypertension), high cholesterol (dyslipidemia), heart disease, stroke, gall bladder disease, breathing difficulties, gout, osteoarthritis, and certain kinds of cancers.

Potential contributing factors to overweight and obesity in students with diabetes are:

- Overeating
- Unhealthy carbohydrate food choices
- Eating foods with high fat, sugar, and carbohydrates that are low in fiber
- Decreased physical activity
- Frequent low blood glucose requiring treatment (fast-acting carbohydrates)
- Over-treating low blood glucose by eating high-calorie carbohydrate foods (e.g., candy bars and cookies)

### Cholesterol

Despite a lack of data on children and adolescents, data from studies in adults demonstrate that when considering risk, having diabetes is equivalent to having had a heart attack, making diabetes a key risk factor for future cardiovascular disease. Therefore, it is important to reduce cardiovascular risk for students with diabetes through lifestyle changes to improve cholesterol (lipid) levels. Children under age eight with elevated cholesterol levels are encouraged to work with a registered dietitian. Medication is an option if lifestyle changes are unsuccessful in lowering cholesterol levels into a safe range.

The goal for LDL-cholesterol in children and adolescents with diabetes is < 100 mg/dL. If LDL-cholesterol is 100 mg/dL or greater, the student should implement a physical activity plan and reduce saturated fat in the diet through support of a registered dietitian. If the student is 10 years or older, the addition of a statin is recommended in students who, after medical nutrition therapy and lifestyle changes, have LDL-cholesterol > 160 mg/dL or LDL-cholesterol > 130 mg/dL and one or more cardiovascular disease risk factors.

Treatment recommendations change as data on the safety and effectiveness of medications for high cholesterol in young people becomes available. For a complete detailed summary and discussion of lipid screening, refer to the 2008 article “Lipid Screening and Cardiovascular Health in Childhood,” available online at: <http://pediatrics.aappublications.org/cgi/content/full/122/1/198> or refer to the current American Diabetes Association Clinical Practice Recommendations, available online at: [http://professional.diabetes.org/CPR\\_search.aspx](http://professional.diabetes.org/CPR_search.aspx).

## Section 7: Nutrition for Students with Diabetes

### School Parties and Special Occasions

Schools often have special occasions throughout the school year that involve extra food besides the usual lunch. School parties and special occasions provide an opportunity to share and celebrate important events in daily life, are an important part of social learning at school, and are an important opportunity to introduce students to new foods and improve nutrition. Many schools offer healthier selections during special events at school. Providing and encouraging more nutritious alternatives in place of traditional high-sugar, high-fat treats is a healthful approach for schools and students. Healthy foods can taste good and be presented in a fun way. Figure 7 provides a few examples on making healthy foods fun.

**Figure 7: Examples of How to Make Foods Fun**



Some healthy school treats include:

- Fruit and cheese kabobs
- Sugar-free Jell-O with fruit in it
- Apple slices and peanut butter (or other nut butter to avoid peanut allergy)
- Homemade trail mix: dried fruit, unsweetened cereal, nuts, and sunflower/pumpkin seeds
- Whole grain banana, zucchini, or pumpkin bread
- Baked apples and cinnamon mixed with plain yogurt
- Pita chips with low-fat flavored cream cheese

Students with diabetes can have special occasion treats unless their parents object. However, high sugar treats are often high in fat and low in nutritional value. Schools are beginning to promote non-food rewards and incentives and offer sugar-free treats. **Although sugar-free, these items may still contain carbohydrates that can raise a student's blood glucose.** Planning ahead and providing advance notice to families offers the family time to choose an alternate food, designate the amount of the food the student may have, or to arrange for an additional bolus or insulin injection to reduce blood glucose levels resulting from additional carbohydrates eaten.

## Section 7: Nutrition for Students with Diabetes

### School Lunch Accommodations

Students with diabetes must have the same opportunities as other students to receive education and education-related benefits (e.g., school meals). Students will either bring lunch from home or receive school hot lunch. Accommodations may require substitutions to standard meals where a substitution is medically needed or required. The U.S. Department of Agriculture (USDA), the Americans with Disabilities Act and regulations governing the National School Lunch and School Breakfast Programs, require substitutions in regular meals for students unable to eat the usual school meals because of their disability. A physician must certify the substitution modifications and complete the Children with Special Health Care Needs Eating and Feeding Evaluation form. For more information, see “Accommodating Children with Special Dietary Needs in the School Nutrition Programs: Guidance for School Food Service Staff” from the USDA Food and Nutrition Service:

[http://www.fns.usda.gov/cnd/Guidance/special\\_dietary\\_needs.pdf](http://www.fns.usda.gov/cnd/Guidance/special_dietary_needs.pdf)

Other accommodations for meals/snacks for students with diabetes may include:

- Allowing adequate time to eat a meal or snacks
- Keeping food or snacks available in the classroom
- Availability of fast-acting carbohydrate sources
- Obtaining a school menu in advance (including carbohydrate content)
- Advance notice for special parties or school events

Schools must provide a clear distinction between “as prepared” and “as purchased” when providing information on carbohydrates, protein, or fat content of foods. This assists the student and/or family to accurately pre-count the carbohydrate in the meal to ensure the correct amount of insulin is given. Pre-planning is an excellent strategy to accommodate students with less flexibility, especially those with fixed insulin doses at each meal. Students may need assistance with counting carbohydrates and obtaining nutrition information, including standard portion size of each food item available at school (determined by federal regulations).