CARBOHYDRATE COUNTING FOR INSULIN ADMINISTRATION IN THE SCHOOL SETTING

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OBJECTIVES

• Learn how to carb count for meals and snacks
• Understand label reading and other methods to calculate carb counts
• Apply carb counting to manage blood glucose levels
• Learn how to prepare the student for physical activity/sports
THE IMPORTANCE OF CARB COUNTING

• Studies show that people with better carb counting skills have better BG control.

• Counting carbs is the best way of keeping blood sugars under control—better than limiting sugars, counting calories or using an exchange system.

• Inaccurate carb counting can lead to low blood sugars or hyperglycemia by wrongly estimating insulin before meals.

• Inaccurate carb counting is also associated with higher blood sugars after meals. Adolescents with the most accurate carb counting skills (less than 10g off) had better BG control and a lower A1C.
WHY COUNT CARBOHYDRATES?

• Food is made up of many different nutrients:
  • Carbohydrate
  • Protein
  • Fat
  • Vitamins & Minerals
  • Water
  • Fiber

• Our bodies need a little bit of each of these nutrients but someone with diabetes needs to pay close attention to the amount of carbohydrate they consume.

• Carbohydrate is the nutrient that breaks down to sugar (glucose) in our bodies as we digest it
ARE CARBOHYDRATES BAD?

• No!
  • Individuals with diabetes must be mindful of how many carbs they eat, they don't need to avoid it altogether. Carbs are the body's main source of fuel and are necessary to maintain proper function.
  • The type of carb and portion size are what matter most.
• Think of your carb intake like rain:
  • We don’t want a drought or a flood but a nice even sprinkling throughout the day!
WHAT IS GLUCOSE?

• Our bodies use carbohydrate for energy by turning it into glucose.

Glucose = energy

• Glucose provides energy for:
  • Cells
  • Brain
  • Every function in the body!
WHAT IS INSULIN?

Insulin = Hormone made by the pancreas

• In order to use energy from glucose, insulin must be available to carry glucose into the cells.

• Because people with diabetes have impaired insulin production, sugar can build up in their blood causing hyperglycemia.

• Our goal: matching carbohydrate intake to insulin needs!
HEALTHY EATING GUIDELINES

• Make ½ your plate **fruits and vegetables**
• Choose **whole grains**
• Choose **low-fat or fat-free** dairy
• Vary your proteins (think **lean**!)
• Eat and drink less **sodium**, **saturated fat**, and **added sugars**
CARB, PROTEIN OR FAT?

- **Carbohydrates:**
  - Grains
  - Beans, starchy vegetables
  - Fruit
  - Milk, yogurt
  - Dessert foods

- **Protein**
  - Beef, pork, poultry, fish
  - Eggs
  - Cheese
  - Nuts, tofu

- **Fat**
  - Butter, margarine
  - Oils, lard, salad dressings
  - Sour cream, mayonnaise
TYPES OF CARBOHYDRATES
STARCH

• Foods high in starch include:
  • Grains like wheat, oats, barley and rice
    • Crackers, tortillas, breads, pasta
  • Starchy vegetables:
    • corn, green peas, potatoes, beets
  • Dried beans, lentils and peas
    • pinto beans, kidney beans, black eyed peas and split peas
SUGAR

• Naturally occurring sugars - milk (lactose) or fruit (fructose)

• Added sugars (sucrose)
  • Common names: table sugar, brown sugar, molasses, honey, beet sugar, cane sugar, confectioner's sugar, powdered sugar, raw sugar, turbinado, maple syrup, high-fructose corn syrup, agave nectar and sugar cane syrup.
FIBER

• A complex carbohydrate
  • Fruits
  • Vegetables
  • Whole grains
  • Nuts
  • Legumes

• Beneficial for digestive health, management of cholesterol levels, and aids in satiety
CARB COUNTING BASICS

- The portion size and carb count of all carb containing foods in a meal or snack must be evaluated and added up to provide total carbohydrates.
CARB COUNTING BASICS

• The average 2000 calorie diet may eat ~45-60g carbs per meal
• Carb consistent diets are usually used at first diagnosis
• Pts may then transition to insulin-to-carb ratio (ICR) for insulin injections or use with an insulin pump (ex. 1:10)
CARB COUNTING APPLICATION

- Carb consistent diets are usually used at first diagnosis

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Breakfast</th>
<th>Morning Snack</th>
<th>Lunch</th>
<th>Afternoon Snack</th>
<th>Dinner</th>
<th>Bedtime Snack</th>
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<tbody>
<tr>
<td>7:00am</td>
<td>45 g</td>
<td>0-15 g</td>
<td>60 g</td>
<td>0-15 g</td>
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<td>0-15 g</td>
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<tr>
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<td>12:00pm</td>
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<td>3:00pm</td>
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<td>5:30pm</td>
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<td></td>
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<td>8:00pm</td>
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<td>8:00pm</td>
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</tr>
</tbody>
</table>

- Pts may then transition to insulin-to-carb ratio (ICR) for insulin injections or use with an insulin pump (ex. 1:10)

A dietitian can help determine a carb prescription that is appropriate for the age and activity level of the child.
## SAMPLE CARB CONSISTENT DIETS

<table>
<thead>
<tr>
<th>Girls/Ages (years)</th>
<th>Grams of Carbs</th>
<th>Calories (approx.)</th>
<th>Breakfast</th>
<th>Snack</th>
<th>Lunch</th>
<th>Snack</th>
<th>Dinner</th>
<th>Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>129</td>
<td>1000</td>
<td>30</td>
<td>8</td>
<td>30</td>
<td>8</td>
<td>45</td>
<td>8</td>
</tr>
<tr>
<td>4-5</td>
<td>166</td>
<td>1300</td>
<td>45</td>
<td>8</td>
<td>45</td>
<td>15</td>
<td>45</td>
<td>8</td>
</tr>
<tr>
<td>6-8</td>
<td>150</td>
<td>1300</td>
<td>45</td>
<td>0/15</td>
<td>45</td>
<td>0/15</td>
<td>45</td>
<td>0/15</td>
</tr>
<tr>
<td>9-11</td>
<td>180</td>
<td>1700</td>
<td>45</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
</tr>
<tr>
<td>12-13</td>
<td>180</td>
<td>1700</td>
<td>45</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
</tr>
<tr>
<td>14-16</td>
<td>195</td>
<td>1900</td>
<td>45</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
<td>75</td>
<td>0/15</td>
</tr>
<tr>
<td>17-18</td>
<td>180</td>
<td>1700</td>
<td>45</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
<td>60</td>
<td>0/15</td>
</tr>
</tbody>
</table>
UTILIZING THE CARB COUNT

1. Pt is prescribed a carb consistent diet or ICR
2. Pt calculates the amount of carbohydrate in their meal
3. Carb count is used to ensure compliance with carb consistent diet
   OR to determine amount of insulin needed with ICR
   OR is entered into an insulin pump which calculates insulin dose automatically.
CARB COUNTING METHODS

1. Measuring portion sizes
2. Reading food labels
3. Utilizing websites and/or smartphone apps
4. “Guesstimating”
CARB FOODS LIST

• Use as general guide to learn food groups and portion sizes
• Not always as accurate as food label
• Encourage students to refer to list when struggling to carb count
• Take a picture of the list and keep it in your phone for quick reference
NON-CARB FOODS LIST

• AKA “free foods”
• Fill up on non-starchy vegetables and lean proteins
• Choose healthy unsaturated fats

NON-CARBOHYDRATE FOODS

These foods do not raise blood glucose levels significantly.

NON-STARCHY VEGETABLES
- artichoke
- asparagus
- bamboo shoots
- beans (green, Italian)
- beets
- broccoli
- Brussels sprouts
- cabbage
- carrots
- cauliflower
- celery
- coleslaw, no dressing
- cucumber
- eggplant
- greens (collard, kale, turnip)
- leeks
- mushrooms
- okra
- onions
- peas pods or pea snaps
- peppers
- radishes
- salad greens
- sauerkraut
- soybean sprouts
- spinach
- squash (summer, zucchini)
- tomatoes
- turnips
- water chestnuts

PROTEINS (Meat & Meat Substitutes)
- Prepare meats without butter/dressing*
- Meats
  - beef
  - chicken
  - fish
  - pork
  - shellfish
  - wild game
  - processed sandwich meats
- Meat Substitutes
  - beef jerky
  - cheese
  - cottage cheese
  - egg substitutes
  - egg whites
  - whole egg
  - hot dog
- Plant-Based Proteins
  - Nut spreads (almond, peanut butter, or soy)

*Butter/breading contains carbohydrates

FATS
- Fats will help slow the rise of blood glucose after meals. These should be used sparingly.
- choose low-fat versions of all fats when possible.
- fat should represent 30% or less of daily intake.

Unsaturated Fats Monounsaturated
- avocado
- nuts
- olive, canola or peanut oil
- black olives
- green olives

Unsaturated Fats Polyunsaturated
- low fat margarine, reduced fat mayo or salad dressing
- stick or tub margarine, regular mayo or salad dressing,
- oil: corn, cottonseed, flaxseed, grape seed, safflower, sunflower, enro soybean
- walnuts halves

Saturated Fats
- stick butter, lard, Shortening
- coconut, palm
- reduced fat butter, heavy cream, regular cream cheese
- light cream, reduced fat cream cheese
- regular sour cream and coconut
- bacon
- light sour cream

OTHER
- Non-nutritive sweeteners
  - Splenda® (sucralose)
  - Equal® (aspartame)
  - Truvia® (stevia)
  - Sweet N’ Low® (saccharin)
- Sugar free:
  - Jello/ gelatin
  - Popkicks
  - Cool Whip®
READING FOOD LABELS

Servings per Container
It is important to know how many servings are in the package as a whole. If you eat all 8 servings in this container, you will need to multiply all nutrition values by 8.

Serving Size
Start with the serving size. All of the nutrition values listed on the label are for that one serving size.

* Serving Size grams
This is the product weight in grams and not grams of carbohydrates. This is helpful if you have a food scale.

Total Carbohydrates
To count carbohydrates, look at the grams of total carbohydrates. Dietary fiber and total sugars are included in total carbohydrate amount.
• How many servings in this product?  
  8 servings

• What is the serving size of this product?  
  2/3 cup

• How many grams of carbohydrates in this product?  
  37g

• How many grams would be in 2 servings of this product?  
  74g
USEFUL TOOLS

• Apps
  • My Fitness Pal
  • Calorie King
  • Carb Counting with Lenny

• Websites
  • https://www.myfitnesspal.com
  • http://www.lillydiabetes.com

• Book
  • Calorie King 2020!
SWEETS & SNACKS
CARB COUNTING FOR TREATS AND SWEETS

• Mini cupcake (15g CHO) vs regular (35-40g)

• Lofthouse cookie (~25g) vs mini Lofthouse cookie (~10)

• Small slice of birthday cake (~40g)
<table>
<thead>
<tr>
<th>15g CARBOHYDRATE SNACKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 small apple</td>
</tr>
<tr>
<td>Half of a banana</td>
</tr>
<tr>
<td>½ mango</td>
</tr>
<tr>
<td>1 cup watermelon</td>
</tr>
<tr>
<td>1 medium orange</td>
</tr>
<tr>
<td>12 fresh cherries</td>
</tr>
<tr>
<td>15 medium Strawberries or 1 ¾ cup grapes</td>
</tr>
<tr>
<td>2 small plums, clementines, apricots</td>
</tr>
<tr>
<td>1 small bunch (<strong>17 grapes</strong>)</td>
</tr>
<tr>
<td>¼ cup raisins or small matchbox size</td>
</tr>
<tr>
<td>½ cup unsweetened applesauce</td>
</tr>
<tr>
<td>½ cup canned fruit in juice (not syrup)</td>
</tr>
<tr>
<td>1 slice toast</td>
</tr>
<tr>
<td>100 Calorie Snack Pack - Cookie</td>
</tr>
<tr>
<td>½ cup ice cream (not including cone)</td>
</tr>
<tr>
<td>8 oz white milk</td>
</tr>
<tr>
<td>½ cup sugar free pudding</td>
</tr>
<tr>
<td>4 oz yogurt (Check Label)</td>
</tr>
<tr>
<td>100 Calorie Snack Pack - Cracker</td>
</tr>
<tr>
<td>8 animal crackers</td>
</tr>
<tr>
<td>1 oz bag chips</td>
</tr>
<tr>
<td>15-20 pretzels</td>
</tr>
<tr>
<td>15-20 Cheez-Itz®</td>
</tr>
<tr>
<td>1 granola bar (Check Label)</td>
</tr>
</tbody>
</table>
# Healthy Combination Snack Ideas

Great snacks include 15g carbohydrate + protein

<table>
<thead>
<tr>
<th>Snack Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 animal crackers &amp; 2 tablespoons peanut butter</td>
</tr>
<tr>
<td>1 slice toast &amp; 2 tablespoons peanut butter</td>
</tr>
<tr>
<td>3 cups plain popcorn &amp; 1 oz nuts</td>
</tr>
<tr>
<td>15-20 Cheese-Itz crackers &amp; 1 oz cheese</td>
</tr>
<tr>
<td>1 small fruit &amp; 1 oz cheese</td>
</tr>
<tr>
<td>1 ounce mini muffin &amp; ½ cup cottage cheese</td>
</tr>
<tr>
<td>½s sandwich (meat, cheese, vegetables or peanut butter with no jelly)</td>
</tr>
<tr>
<td>6 saltine crackers &amp; ¼ cup tuna salad</td>
</tr>
<tr>
<td>15-20 baked tortilla chips &amp; 2 tablespoons hummus</td>
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<tr>
<td>------------------------</td>
</tr>
<tr>
<td><strong>CLINICAL NUTRITION</strong></td>
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<tr>
<td>Healthy Combination Low or No Carbohydrate Snack Ideas</td>
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<tr>
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</tr>
<tr>
<td><img src="image1" alt="Turkey and Cheese Roll Ups" /></td>
</tr>
<tr>
<td>turkey and cheese roll ups</td>
</tr>
<tr>
<td><img src="image4" alt="Celery and Peanut Butter" /></td>
</tr>
<tr>
<td>celery and peanut butter</td>
</tr>
<tr>
<td><img src="image7" alt="Tomato and Mozzarella" /></td>
</tr>
<tr>
<td>tomato and mozzarella</td>
</tr>
</tbody>
</table>
PREPARING FOR ACTIVITY
Regular physical activity is important for overall health and wellness.

It's important to balance insulin doses with carb intake (meals/snacks) and activity level.

If blood glucose is less than 100 mg/dL or greater than 300 mg/dL, no strenuous exercise until blood glucose levels are within range.
CHALLENGES & CONSIDERATIONS OF BG MANAGEMENT WITH EXERCISE

• Every athlete has a unique BG response before, during, after exercise
  • Type and amount of CHO in diet, intensity, duration, temperature/altitude, performance anxiety/excitement
• Daytime and nocturnal hypoglycemia are common during and after exercise
• Adjusting basal and/or long acting insulin may be necessary before exercise
## PREVENTING HYPOGLYCEMIA

### Prior to Exercise
- A BG value of 120-180 mg/dL is a good starting point for activity
- Check BG before exercise; if BG >250 mg/dL, check for ketones (ketones, NO exercise)
- *BEFORE* Boluses/basal rate may need to be reduced before exercise (especially long-lasting exercise) to prevent hypoglycemia.

### During Exercise
- Measure BG every 30 minutes during exercise
- *DURING* A CHO snack 30 min into exercising may be necessary

### After Exercise
- Measure BG immediately after and 2-4 hours post exercise.

*AFTER exercise, the greatest concern is* late-onset hypoglycemia, which may occur due to low glycogen levels. Prevention strategies include consuming additional CHO (via bedtime snack) and/or reducing basal rate or long-acting insulin after HIIT or an extended practice.

*Emphasize proper recovery.* Replenish muscle glycogen right after exercise (within 30-60 minutes) by taking in adequate carbohydrate, you’ll be less likely to get as low later on.
<table>
<thead>
<tr>
<th>Intensity</th>
<th>Examples</th>
<th>If blood glucose is...</th>
<th>Then eat...</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>Walking a half mile or leisurely biking for less than 30 minutes.</td>
<td>Less than 100 mg/dL</td>
<td>15g carbohydrate per 60 minutes</td>
<td>1 fruit or bread serving (1/2 cup orange juice or 1/4 bagel)</td>
</tr>
<tr>
<td>Light</td>
<td></td>
<td>100 mg/dL or above</td>
<td>No food needed</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Tennis, jogging, swimming, baseball, leisurely biking, gardening, golfing, vacuuming for 30 minutes to 1 hour.</td>
<td>Less than 100 mg/dL</td>
<td>15-30 g carbohydrate before exercise, then 10-15 g per 30-60 minutes of exercise</td>
<td>1 milk and 1 fruit serving; or 1 milk and 1 bread (1 cup plain yogurt and 1/2 banana; or cereal and 1 cup milk)</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td>100 mg/dL or above</td>
<td>15-30 g carbohydrate per 30-60 minutes of exercise</td>
<td>1 fruit or 1 bread serving (1/2 banana or 8 saltine crackers)</td>
</tr>
<tr>
<td>Strenuous</td>
<td>Football, hockey, racquetball, basketball, strenuous biking, swimming, soccer, lacrosse, raking leaves.</td>
<td>Less than 100 mg/dL</td>
<td>Give 15 g fast acting carbs, recheck in 15 min., if BG &gt; 100 mg/dL, okay to exercise, follow instructions below.</td>
<td>Fast acting carbs: 4 oz. juice, 4 glucose tablets, etc.</td>
</tr>
<tr>
<td>Strenuous</td>
<td></td>
<td>100 mg/dL or above</td>
<td>30-45 g carbohydrate per 30-60 minutes. Check blood glucose often</td>
<td>2 bread servings with either 1 milk or 1 fruit (2 slices toast, with 1 cup fat-free [skim] milk or 1 small orange)</td>
</tr>
</tbody>
</table>
Texas Children’s Hospital is affiliated with Baylor College of Medicine in the areas of pediatrics, pediatric surgery, and obstetrics and gynecology. Currently and throughout the 60-year partnership, Texas Children’s serves as Baylor’s primary pediatric training site, and more than 1,500 Baylor faculty are the division chiefs and staff physicians of Texas Children’s patient care centers.