Carbohydrate Counting: Basic to Advanced

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IHS Division of Diabetes

Outline:

- Carb Awareness
- Basic/Consistent
- Advanced

Counting "Carbs"

- Carbs in Honey Bun? ___g
- Carbs in 1 block package of Ramen? ___g
- Favorite foods with Carbs?
- Carb Counting Resources:

_____

Carbohydrate Counting

- MNT works!
- One of many meal planning approaches
- Carbs - Up BG
- Continuum - **Individualized**
  - Carb Awareness
  - Basic – Consistent Carbohydrates
  - Advanced – Carb/Insulin Ratio

Franz MJ, et al., J Am Diet Assoc. 2004;104:1805-15.
Standards of Medical Care in Diabetes - 2013. Diabetes Care.
American Diabetes Association Guide to Nutrition Therapy for Diabetes. 2012.

Assessment

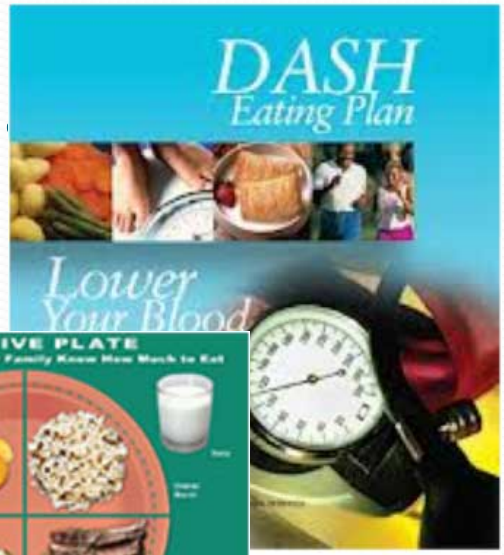
- A1C target met?
- SMBG?
- Typical meal pattern
- Medications?
- Health literacy & numeracy
- Meal planning approach? _____
  - Introduce concept of carbohydrate counting
  - Establish carbohydrate target ranges

Factors Influencing BG

- Amount of carbohydrates
- High fat foods/meals
- Incorrect insulin dose/missed dose
- Other medications
- Injection site
- Physical activity
- Stress
- Illness
- _____

Healthy Eating – General Recommendations

- Choose healthy foods (fruits/veg/whole grains/lean protein/unsaturated fats
- Set an eating schedule, i.e.,
  - Eat 3 small-to-medium sized meals; include some carbs/meal
- Avoid "liquid sugar"
- Meal plans to consider…



Carb Awareness

- Identify foods that do and do not contain carbs
- A Controlled Carb meal plan…not a Low Carb meal plan
- RDA 130 g/day (≈ 9 choices)
- Average adult carb intake ___%Kcal?
- Individualize the amount of carb for meals and snacks/day
- Estimate accurately amount of carbs in food servings

DCCT, Look AHEAD, NHANES
http://ndb.nal.usda.gov/ndb/search/list

What foods have carbohydrates?

- Breads, cereals, and grains
- Starchy vegetables
- Dried beans and lentils
- Fruits
- Milk and yogurt
- Sweets, desserts, regular soda

What foods have little or no carbohydrates?

- Non-starchy vegetables
- Meat, poultry, fish, eggs,
- cheese, soy/meat substitutes
- Fats/oils

Plate Method – Carb Awareness

http://www.ihs.gov/MedicalPrograms/Diabetes/HomeDocs/Resources/InstantDownloads/MyNativePlate1_508c.pdf

For people who:

- Are less active
- Are older
- Need to eat less calories

At meals, keep rice, beans, pasta, and starchy veggies to **one-fourth** of a place, add one serving fruit, and/or one serving milk/yogurt

Camelon KM, et al. The Plate Method. J Am Diet Assoc. 1998;98(10):1155-8

Plate Method – Carb Awareness (cont.)

http://www.ihs.gov/MedicalPrograms/Diabetes/HomeDocs/Resources/InstantDownloads/MyNativePlate1_508c.pdf

For people who:

- Are active
- Are younger
- Want to stay at same weight

At meals, keep rice, beans, pasta, and starchy veggies to **one-half** of a plate, add one serving fruit, and/or one serving milk/yogurt

IHS DDTP Resources

http://www.ihs.gov/MedicalPrograms/Diabetes/RESOURCES/Catalog/index.cfm

Eating Issues and Nutrition Tips for Educators Using

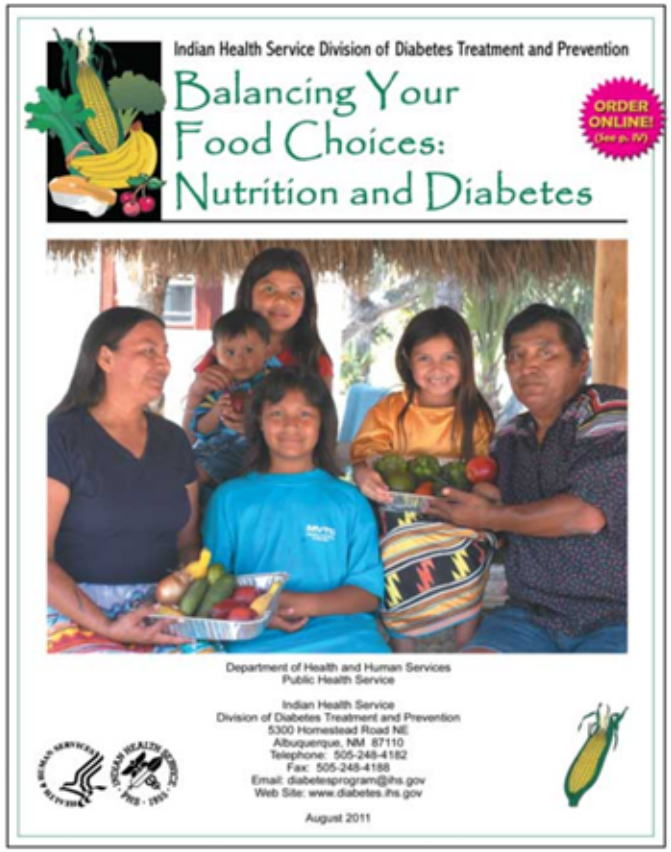
MY NATIVE PLATE

My Native Plate provides a visual guide to help your clients and patients eat balanced meals of reasonable portion sizes. Use it as a starting point for nutrition education, a daily reminder, and a way to introduce healthy eating to family members of all ages. Read the following five *Issues to Consider* prior to using *My Native Plate*. Download and distribute *Ten Tips to a Great Plate*™ when your clients are ready for more information.

Issues to Consider

Understanding a few issues that affect people's eating habits can help you introduce *My Native Plate* to your clients. Keep these points in mind and discuss them in a positive, supportive way:

1. **Emotions and stress can impact your clients' food selection and portion sizes.** The reasons why people eat certain foods, and why they overeat, are often linked to depression, anxiety and stress.
   - Ask your clients what they are eating, how much and possible reasons why.
   - Refer them to other health care professionals, spiritual leaders or counselors if needed.
2. **Not consistently having enough money to buy good quality food will affect your clients' eating habits.** Food insecurity can cause your clients to overeat available foods, skip meals and/or choose unhealthy foods that are less expensive.
   - Find out if your clients have consistent access to nutritious foods and are getting enough nutrition from the foods they usually eat.
   - Refer them to community food resources program if needed.
3. **Family and social gatherings are important to your clients and can affect healthy eating.** Not eating foods brought to gatherings, potlatches and potlucks can be considered rude. Suggest ways your clients


Indian Health Service Division of Diabetes Treatment and Prevention

Balancing Your Food Choices: Nutrition and Diabetes

ORDER ONLINE! (See p. IV)

Department of Health and Human Services
Public Health Service

Indian Health Service
Division of Diabetes Treatment and Prevention
5300 Homestead Road NE
Albuquerque, NM 87110
Telephone: 505-248-4182
Fax: 505-248-4188
Email: diabetesprogram@ihs.gov
Web Site: www.diabetes.ihs.gov

August 2011

How do you count carbs?

- Count grams of carbohydrate
- Count carb choices

("servings", "exchanges")

15 grams = 1 carb choice

- Reliable websites:
  - Calorie King www.calorieking.com
  - USDA Nutrient Database http://ndb.nal.usda.gov

- To determine amount:
  - Weigh and measure with portion control tools
  - Ask patients to measure portions using their plates, bowls, & glasses
  - Use food models as a teaching tool

1 Carb Choice = 15 g. Carbohydrates

Food Group	Serving Size
Bread, cereal	1 slice, ¾ cup unsweetened
Pasta, rice	1/3 cup
Starchy veg – potato, corn, beans	½ cup
Fruit	1 small piece, ½ cup canned
Milk & plain yogurt	1 cup
Sweets/snack foods	2 small sandwich cookies, ½ cup ice cream, 15 snack chips, 1 tbsp. jelly
Nonstarchy vegetables	3 cups raw (salad), 1 ½ cups cooked

Basic/Consistent Carbohydrate Intake

- Emphasize day-to-day consistency
- General Targets
  - Premeal 70-130 mg/dL
  - 2° postmeal <180 mg/dL
- Improve glycemic control through managing patterns of BG as they relate to food intake, diabetes medication, and physical activity.
- Client willing to keep food, BG, physical activity records
- Client willing to weigh/measure food portions
- Educator teaches:
  - carbohydrate grams or choices
  - portion sizes
  - BG/food/activity patterns

General Guidelines: Carbs/Meal

Women

- To lose weight
  - 30-45 g
- To maintain weight
  - 45-60 g
- For very active
  - 60-75 g
  - Snacks: 15-30 g

Individualize

Men

- To lose weight
  - 45-60 g
- To maintain weight
  - 60-75 g
- For very active
  - 60-90 g
  - Snacks: 15-30 g

Individualize

Reading Nutrition Facts Label

Sample label for
Macaroni & Cheese

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250 Calories from Fat 110

	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
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.

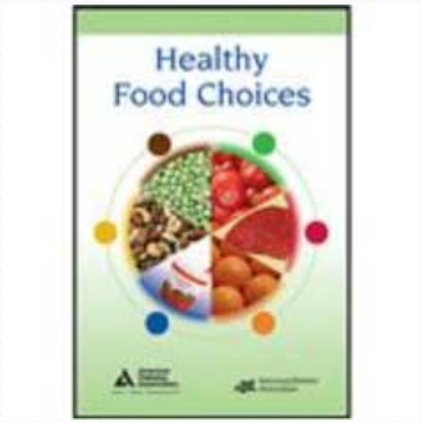
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

1. Find the serving size – compare to actual portion eaten
2. Find Total Carbohydrate*
3. Count grams of carbs or carb choices

- 1 cup = 31 g. carbohydrate or
- 1 cup = 2 carb choices

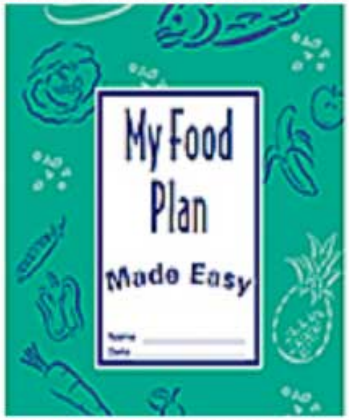
- *Dietary fiber, sugars, sugar alcohols **included** in Total Carbohydrate

Basic Patient Education Resources



Healthy Food Choices, 3rd Edition. Mini-poster. American Diabetes Association.
http://www.shopdiabetes.org/177-healthy-food-choices-25pk.aspx

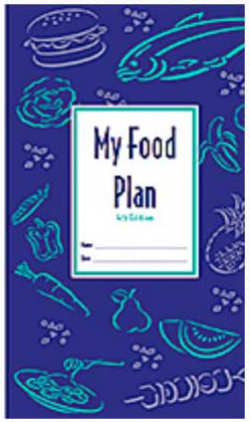
AADE7™ Self-Care Behaviors: Healthy Eating
2-page download; available at:
http://www.diabeteseducator.org/export/sites/aade/_resources/pdf/general/AADE7_healthy_eating.pdf

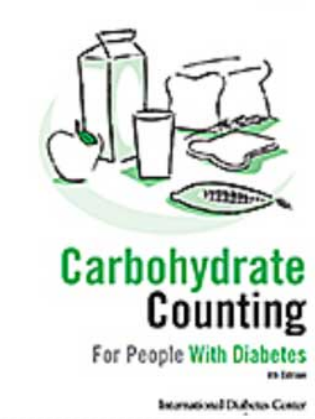


My Food Plan Made Easy, 2nd Edition. International Diabetes Center.
http://www.idcpublishing.com/My-Food-Plan-Made-Easy/productinfo/2058-MFPE/

Patient Education Resources

My Food Plan.
My Food Plan for Gestational Diabetes.
4-fold with 8 panels, carb counting guide.
Carbohydrate Counting. 31p booklet.
International Diabetes Center.
http://www.idcpublishing.com





Ready, Set, Start Counting:
Carbohydrates Counting.
3-page download. Free. DCE Organization.
http://www.dce.org/publications/education-handouts/#ed

Grocery Store Tour
Customized collection of nutrition facts labels (laminated) in a 3-ring binder.

Mobile Apps

GoMeals.com

www.mynetdiary.com
MyNetDiary Diabetes Tracker App

Top Rated Apps by Patients

Apple App

- Calorie Counter by MyFitnessPal
- Calorie King
- Calorie Counter by MyNetDiary

Android App

- Calorie Counter by MyFitnessPal
- Diet and Calorie Tracker by Sparkpeople
- Calorie Counter by FatSecret

Gilgen E. Smartphone apps to help with diabetes management. AADE in Practice. 2012 Fall:6.

Advanced Carbohydrate Counting

- Match fast-acting insulin doses to carb intake based on carb-to-insulin ratios and correction factors
- **31% - insulin therapy (2012 IHS DM audit)**

- Understand BG targets
- Accurately count carbs
- Willingness/ability to keep food, activity, insulin, BG logs
- See BG patterns, make adjustments
- Multiple visits, reinforcement, ongoing support from DM team

Warshaw HS, Kulkarni K. Complete Guide to Carb Counting. 2011.

Carb-to-Insulin Ratio

- Helps determine bolus dose of fast-acting insulin to "cover" the carbs at a meal or snack.
- Total grams of carbs disposed by X unit(s) of insulin

g carb ÷ # units bolus insulin = __ g carb/1 unit insulin

Determine Carb:Insulin Ratio

1. Quick and Easy Method
2. Pattern Management
3. Rule of 500 or Rule of 450

UC San Francisco Diabetes Teaching Center

http://dtc.ucsf.edu/types-of-diabetes/type2/treatment-of-type-2-diabetes/medications-and-therapies/type-2-insulin-rx/calculating-insulin-dose/0/450

Determine Carb:Insulin Ratio Quick and Easy Method

g carb ÷ # units bolus insulin = __ g carb/1 unit insulin

- Starting ratios:
  - 15:1 (15 g carb for 1 unit fast-acting insulin)
  - Ratios vary
    - 10:1 (insulin resistant/obese)
    - 20:1 (young, thin)

Determine Carb:Insulin Ratio Pattern Management

- Review food, insulin, and BG records (3-7 days)
- Identify trends
- Gram Method
  - Carb (g) ÷ X units bolus insulin = __ g carb/1 UI
  - Case Study: Usually eats 70 grams Carb for dinner, and he takes 7 units insulin

70 g carb ÷ 7 units insulin = 10:1 (carb:insulin ratio)

10 g. carb covered by 1 unit insulin

Determine Carb: Insulin Ratio

500 and 450 Rule (Type 1) Walsh J, Roberts R. The Pocket Pancreas, 2000

500 (450) ÷ total daily dose (TDD) of fast-acting insulin

Case Study: Total daily dose is 50 units rapid-acting insulin =

500 ÷ 50 = 10 g carb covered by 1 unit rapid-acting insulin = 10:1

	500 Rule	450 Rule
Total daily dose of insulin	Carb (g) covered by 1 unit rapid-acting insulin	Carb (g) covered by 1 unit regular insulin
20 units	25 g	23 g
25	20	18
30	17	15
35	14	13
40	13	11
50	10	9
60	8	8

Carb: Insulin Ratio

Case Study:

Breakfast	Lunch	Dinner
10:1	15:1	15:1

Lunch: Cheeseburger (35 g)
small salad (4 g)
vinaigrette dressing (3 g)
1 chocolate chip cookie (21 g)
diet soda (0 g)

Total carbs for lunch? _____ g.

How much insulin should she take before lunch? ___units

If BG out of target range:

- If 2 hr PPG is too high – decrease ratio: less carb/unit insulin
  - Go from 15:1 ratio to 10:1 ratio
- If 2 hr PPG is too low – increase ratio: more carb/unit insulin
  - Go from 15:1 ratio to 20:1 ratio

Carb:Insulin Ratio

What is an Insulin Correction Factor?

- Used to calculate the amount of bolus insulin to bring BG into target range
- This adjusts or corrects a BG that is higher or lower than desired before a meal
- Ex: 1 unit of insulin to drop BG by 50 mg/dL

- General BG Range Targets
  - Pre-meal 70-130 mg/dL
  - Post-meal <180 mg/dL

  (2 hours after first bite)

ADA Clinical Practice Recommendations, 2013

- Individualize

Using Insulin Correction Factor

$$\frac{\text{Current Blood Glucose} - \text{Target Blood Glucose}}{\text{Insulin Correction Factor (X points)}}$$

Case Study:

Assume 1 unit will drop blood glucose 35 points (insulin correction factor)

Pre-meal BG = 190 mg/dL

Target BG = 120 mg/dL

Insulin correction dose = difference between the actual BG minus target BG divided by the correction factor

$$\frac{190 \text{ mg/dL} - 120 \text{ mg/dL}}{35} = 70 \div 35 = 2 \text{ units of insulin}$$

Total Mealtime Insulin Dose

Case Study:
Plan to eat 60 g of carb.
Carb:insulin ratio is 10:1 (10 g. carb covered by 1 unit of insulin)
60 g. carb ÷ 10 = 6 units of insulin needed for this amount of carbs

And assume 1 unit will drop blood glucose 35 points (insulin correction factor)

Pre-meal BG = 190 mg/dL
Target BG = 120 mg/dL

Insulin correction dose = difference between the actual BG minus target BG divided by the correction factor

$\frac{190 \text{ mg/dL} - 120 \text{ mg/dL}}{35} = 70 \div 35 = 2$ units of insulin

6 units (carbohydrate coverage dose)
\+ 2 units (BG correction dose)
Total Mealtime Insulin Dose = 8 units

Mealtime Insulin Dosing: Simple Algorithm vs. Carb Counting

Baseline	Basal	Bolus	TDD	A1C
Algorithm	53.9	53.9	107.8	8.1
Carb Count	50.5	50.5	100.9	8.3

At 24 Weeks	Basal	Bolus	TDD	A1C	Weight Gain (lb.)
Algorithm	108.7	102.5	207.4	6.7	7.9
Carb Count	88.9	86.4	175.5	6.5	5.3

Bergenstal RM, et al. Adjust to target in type 2 diabetes. Diabetes Care. 2008 Jul;31(7):1305-10

Bergenstal RM, et al. Diabetes Care. 2008 Jul;31(7):1305-10

Basal Insulin Adjustments

Table 1—

Insulin glargine and insulin glulisine dose adjustment based on pattern of mealtime blood glucose values for the past week

Insulin glargine adjustments: both groups	
Mean of last 3-day fasting SMBG mg/dl	**Adjustment**
>180 mg/dl	Increase 8 units
140–180 mg/dl	Increase 6 units
120–139 mg/dl	Increase 4 units
95–119 mg/dl	Increase 2units
70–94 mg/dl	No change
<70 mg/dl	Decrease by the same number of units as insulin glulisine

Bolus Insulin Adjustments

Simple Algorithm	Mealtime dose	Pattern of mealtime BG below target	Pattern of mealtime BG above target
	≤ 10 units	Decrease by 1 unit	Increase by 1 unit
	> 11-19 units	Decrease by 2 units	Increase by 2 units
	≥20 units	Decrease by 3 units	Increase by 3 units

Carb Counting	Mealtime dose	Pattern of mealtime BG below target	Pattern of mealtime BG above target
	1 unit/20 g	Decrease to 1 unit/25 g	Increase to 1 unit/15 g
	1 unit/15 g	Decrease to 1 unit/20 g	Increase to 1 unit/10 g
	1 unit/10 g	Decrease to 1 unit/15 g	Increase to 2 units/15 g
	2 units/15 g	Decrease to 1 unit/10 g	Increase to 3 units/15 g
	3 units/15 g	Decrease to 2 units/15 g	Increase to 4 units/15 g

Bergenstal RM, et al. Diabetes Care. 2008 Jul;31(7):1305-10

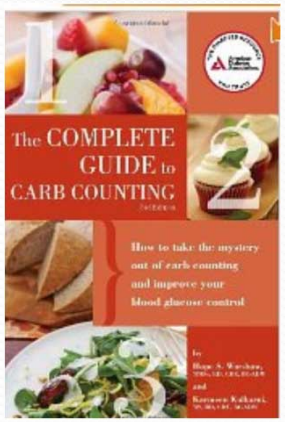
Resources for Intensive Therapy

Complete Guide to Carb Counting.
3rd Edition. 2011, 169 pages. American Diabetes Association

Blood Glucose Pattern Control: A Guide for People Who Use Insulin.
3rd Edition. 36 pages. International Diabetes Center

IHS DDTP

- **When and How to Use Insulin Therapy in Type 2 Diabetes.** Richard M Bergenstal, MD (podcast)
- **Advanced Strategies for Diabetes Management: Case Presentations.** JoEllen Habas, MD (recorded seminar)
- **Individualizing Diabetes Targets: One Size Does Not Fit All.** Ann Bullock, MD (Advancements webinar)
- **Update on Self-Monitoring Blood Glucose.** Marie Russell, MD MPH (Advancements webinar)
- **Nutrition for Diabetes Prevention & Care** (Best Practice)



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Wishing you much success!