

# Advanced Carb Counting

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Renovating Diabetes Education



International  
Diabetes  
Federation  
Member

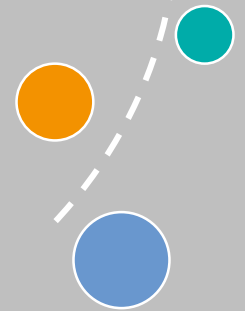


# Disclosure to Participants

- Conflict of Interest (COI) and Financial Relationship Disclosures:
- Presenter (Sima Abbasi): Nothing to declare for this presentation, January 2024
- Non-Endorsement of Products:
- Accredited status does not imply endorsement by any commercial products displayed in conjunction with this educational activity

# Presentation Outline

- Advanced Carb Counting:
  - Combination Foods
- Bolus Insulin Dosing:
  - Insulin-to-Carb Ratio (ICR)
  - Insulin Dosing for high-fat and high-protein meal
  - Insulin Sensitivity Factor (ISF)
  - Prandial Bolus Timing
- Nonnutritive Sweeteners
- A note on low carb diets



# Case:

An 18 year old girl:

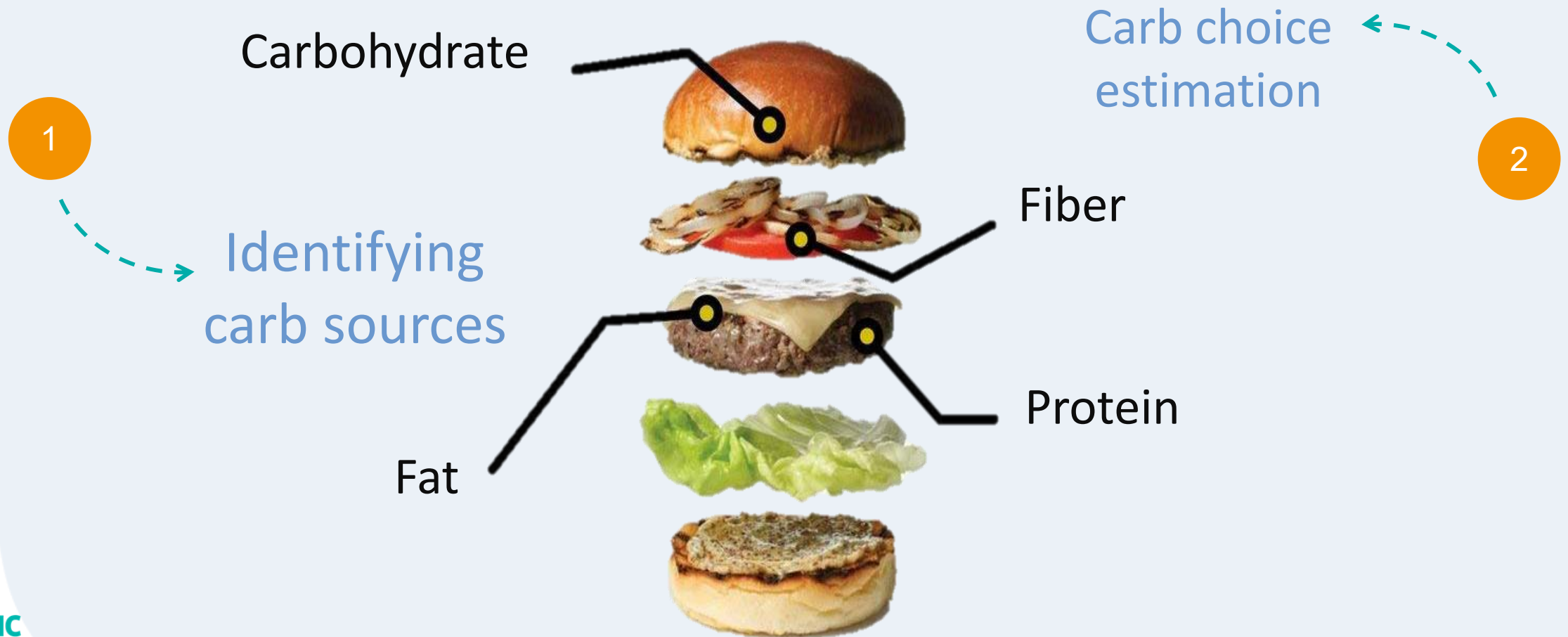
- Estimated TDD  $\approx$  45 units
- On MDI: Glargine U-300, Glulisine
- Glulisine: 5-7 units based on patient estimation of the meal
- Pre-lunch BS: 100 mg/dL

وعده غذایی:

- یک چیزبرگر متوسط (۹۰ گرم نان)
- یک لیوان دلستر
- سیب زمینی سرخ کرده ساده (۱۲ عدد)
- دو عدد سس کچاپ تک نفره

Step 1: Carb Count

# Carb Counting in Combination Foods



# Calculating Bolus Insulin Dose

7 Carb Choices

- یک چیزبرگر متوسط (۹۰ گرم نان) ← ■ ■ ■
- یک لیوان دلستر ← ■ ■
- سیب زمینی سرخ کرده ساده (۱۲ عدد) ← ■
- دو عدد سس کچاپ تک نفره ← ■

Step 2: Calculating Bolus  
Dose to Cover Carb

# Insulin-to-Carb Ratio (ICR)

- ICR is the amount of carbohydrate counteracted by 1 unit of rapid-acting insulin
- Help to determine bolus dose of rapid-acting insulin to “cover” the carbs at a meal or snack.



# Calculating ICR

ICR for Regular insulin

450

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Total Daily Dose

ICR for Rapid-acting insulins  
(Aspart/Glulisine/Lispro)

500

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Total Daily Dose

Preschool children often need proportionally larger bolus doses than older children, one can use a 330 or 250 rule instead of 500.



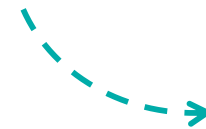
# Calculating ICR

- Estimated TDD  $\approx$  45 units
- Glargine U-300: 26 units 10 P.M.
- Glulisine: 5-7 units based on patient estimation of the meal

$$\text{ICR} : \frac{500}{\text{Total Daily Dose}} = \frac{500}{45} = 11$$



1 Unit bolus insulin



Cover 11 gr Carb

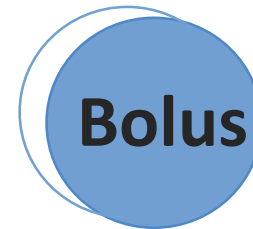


# Calculating ICR

 **Carb choice**

11 gr

15 gr

 **Bolus insulin unit**

1 unit

1.4 unit

# Calculating Bolus Insulin Dose

- An 18 year old girl
- Estimated TDD  $\approx$  45 units
- On MDI: Glargine U-300, Glulisine
- Pre-lunch BS: 100 mg/dL
- ICR: 11 (1.4 Units of bolus insulin for each carb choice)

- یک چیزبرگر متوسط (۹۰ گرم نان)
- یک لیوان دلستر
- سیب زمینی سرخ کرده ساده (۱۲ عدد)
- دو عدد سس کچاپ تک نفره

$$7 \text{ Carb choices} \times 1.4 = 9.8$$

**Step 3:** what about fat?

# Insulin Dosing for high-fat and high-protein meal

- A suggested starting point for additional insulin is a 20% increase in the dose calculated for carbohydrate alone, accompanied by a split bolus.
- Optimum combination bolus split may differ based on age:
  - for children and adolescents is 60/40% or 70/30% split delivered over 3 hours.
  - for adults is a range from 10%/90% to 50%/50% and a delivery duration from 2 to 3 hours.

# Calculating Bolus Insulin Dose

- An 18 year old girl
- Estimated TDD  $\approx$  45 units
- On MDI: Glargine U-300, Glulisine
- Pre-lunch BS: 100 mg/dL
- ICR: 11 (1.4 Units of bolus insulin for each carb choice)



$$9.8 \times 0.2 = 1.96$$

$$9.8 + 1.96 = 11.76$$

**Step 4:** Combination Bolus Split and SMBG



# Calculating Bolus Insulin Dose

An 18 year old girl

- Estimated TDD  $\approx$  45 units
- Pre-lunch BS: 220 mg/dL
- Pre-lunch BS target: 100 mg/dL
- ICR: 11 (1.4 Units of bolus insulin for each carb choice)

وعده غذایی:

• یک بشقاب ماکارونی (معادل یک لیوان)

• یک پیاله ماست

• سبزی خوردن

# Calculating Bolus Insulin Dose

3 Carb Choices

- یک بشقاب ماکارونی (معادل یک لیوان) ← ■ ■
- یک پیاله ماست ← ■
- سبزی خوردن

Step 2: Calculating Bolus  
Dose to Cover Carb



# Calculating Bolus Insulin Dose

- An 18 year old girl
- Estimated TDD  $\approx$  45 units
- Pre-lunch BS: 220 mg/dL
- Pre-lunch BS target: 100 mg/dL
- ICR: 11 (1.4 Units of bolus insulin for each carb choice)

- یک بشقاب ماکارونی (معادل یک لیوان)
- یک پیاله ماست
- سبزی خوردن

$$3 \text{ Carb choices} \times 1.4 = 4.2$$

**Step 3:** what Pre-lunch BS?

# Insulin Sensitivity Factor (ISF)

- ISF also known as insulin correction factor can be used to adjust insulin dose for hyperglycemia before or between meals.
- ISF is the amount by which 1 unit of rapid-acting insulin will lower blood glucose



# Calculating ISF

ISF for Regular insulin

1500

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Total Daily Dose

ISF for Rapid-acting insulins  
(Aspart/Glulisine/Lispro)

1800

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Total Daily Dose

For Preschool children the usual ISF often needs to be adjusted to give smaller correction doses during late night/early morning and larger doses in the evening.

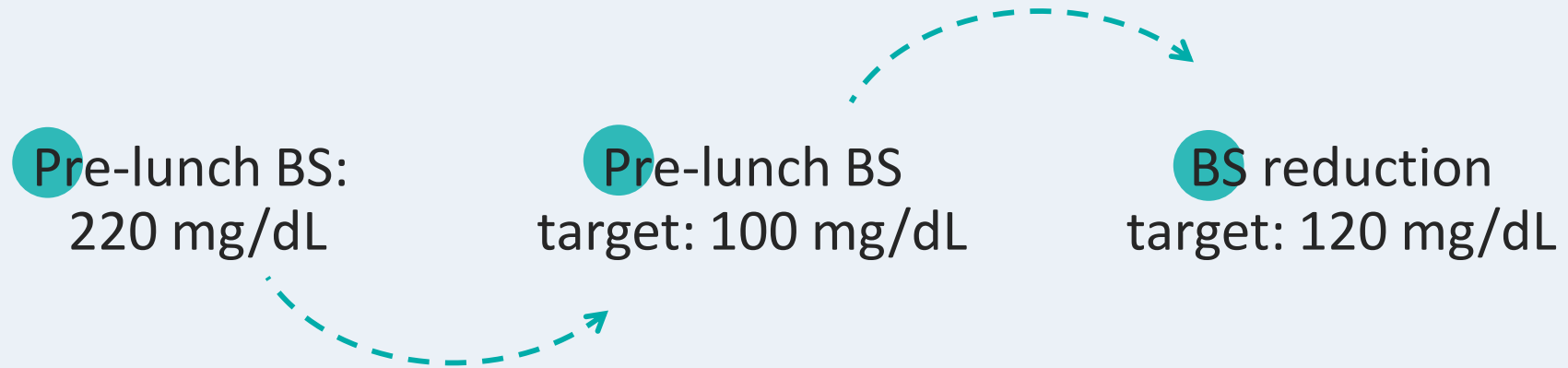
# Calculating ISF

- An 18 year old girl
- T1DM History: 4 years
- On MDI:
- Estimated TDD  $\approx$  45 units
- Glargine U-300: 26 units 10 P.M.
- Glulisine: 5-7 units
- Latest HbA1c: 7.3

$$\text{ISF} : \frac{1800}{\text{Total Daily Dose}} = \frac{1800}{45} = 40$$

- 1 unit of fast-acting insulin  Reduce blood sugar levels by 40 mg/dl

# Calculating Insulin Correction dose



$$\text{Insulin correction dose} = \frac{\text{BS reduction target}}{\text{ISF}} = \frac{120}{40} = 3$$

# Calculating Bolus Insulin Dose

- Estimated TDD  $\approx$  45 units
- Pre-lunch BS: 220 mg/dL
- Pre-lunch BS target: 100 mg/dL
- ICR: 11 (1.4 Units of bolus insulin for each carb choice)
- ISF: 40



Insulin Correction Dose: 3



Insulin Dose for Carbs: 4.2



Total Mealtime Insulin Dose: 7.2

# Prandial Bolus Timing

- Prandial bolus timing is important, regardless of mode of insulin delivery (pump or MDI).
- Pre-prandial bolus insulin given 15 min before the meal is preferable to insulin administered during or after the meal.
- Delivering a bolus dose 15–20 min before eating rather than immediately before improves postprandial glycemia.
- Pre- and postprandial blood glucose testing at 1, 3, 5, and 7 h or CGM can be useful in guiding insulin adjustments and evaluating the outcomes of changes to the insulin dose or timing.



# Nonnutritive Sweeteners

- The use of nonnutritive sweeteners as a replacement for sugar-sweetened products in moderation is acceptable if it reduces overall calorie and carbohydrate intake.
- For people with prediabetes and diabetes, water is recommended over nutritive and nonnutritive sweetened beverages.

**Table 5.1—Medical nutrition therapy recommendations**

## Recommendations

Nonnutritive sweeteners

**5.26** Counsel people with prediabetes and diabetes that water is recommended over nutritive and nonnutritive sweetened beverages. However, the use of nonnutritive sweeteners as a replacement for sugar-sweetened products in moderation is acceptable if it reduces overall calorie and carbohydrate intake. **B**



# A Note on Low Carb Diets

Low carbohydrate diets:  
<26% energy from carbohydrate

People with T2DM

Could be a viable  
option in short term.

Very low carbohydrate diets:  
20–50 g/day carbohydrate

People with T1DM

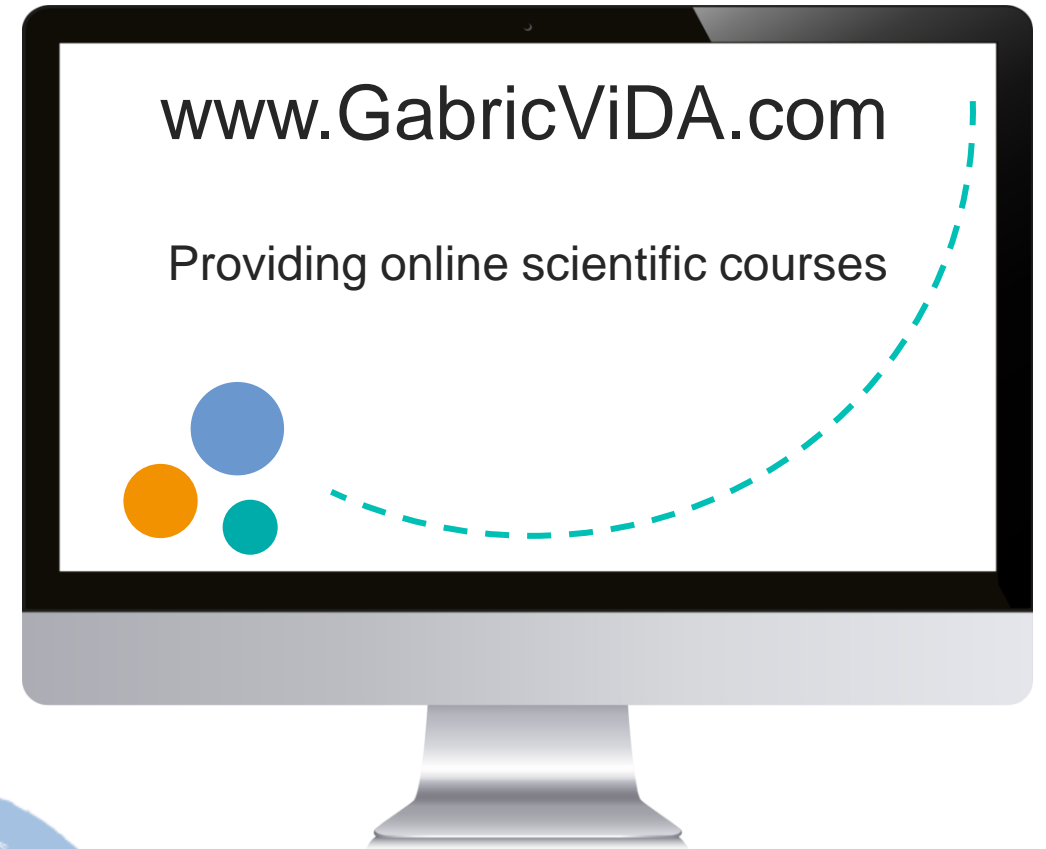
Currently, scientific evidence  
is lacking to support the  
practice of these.

Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes, Standards of Care in Diabetes, 2024.

Diabetes and Nutrition Study Group, & European Association for the Study of Diabetes (EASD). Evidence-based European recommendations for the dietary management of diabetes, 2023.

Nutritional management in children and adolescents with diabetes, ISPAD Clinical Practice Consensus Guidelines, 2022.

# Gabric Diabetes Virtual Academy



Thank you for your attention

