## **Evidence-Based**

## **Nutrition Practice Guidelines,**

# **Recommendations and Interventions**

## to

# **Control the A-B-C's of**

# T1 and T2 Diabetes in Adults





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  - Please refer to learning goals and objectives
  - Learners must attend the full activity and complete the evaluation in order to claim continuing education credit/hours
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- Activity-Type:
  - Knowledge-based

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## **Learning Objectives**

- 1. Name the 3 primary clinical outcomes (goals) for diabetes MNT and the current target values.
- Explain the latest nutrition intervention recommendations to normalize A1c in patients with type 1 and type 2 diabetes.
- 3. Explain the latest nutrition intervention recommendations to normalize **blood pressure** in patients with type 1 and type 2 diabetes.
- 4. Explain the latest nutrition intervention recommendations to normalize **blood lipids** in patients with type 1 and type 2 diabetes. **AADE**16



# Main References with Associated Symbols





- Academy of Nutrition and Dietetics (AND) T1/T2 Diabetes Nutrition Practice Guideline (NPG) Update, 2015
- AND Nutrition Guidelines List, Hypertension Guideline
   Update, Executive Summary, 2015, Evidence Analysis Library
- AND Evidence Analysis Library, Executive Summary, Disorders Lipid Metabolism 2011\*
- Position of the Academy of Nutrition and Dietetics: Dietary Fatty Acids for Healthy Adults, Journal of the Academy of Nutrition & Dietetics, Jan. 2014 Vol .114, No.
- Standards of Medical Care in Diabetes, 2016\* American Diabetes Association
  - \* Date of last update when accessed online on June 12, 2016









- Nutrition Therapy Recommendations for the Management of Adults With Diabetes, Alison B. Evert, et al *Diabetes Care,* Nov. 2013\* vol. 36 no. 11 3821-3842
- 2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk. A Report of the American College of Cardiology/AHA Task Force on Practice Guidelines
- Dietary Guidelines for Americans 2015
- 7th Report of the Joint National Treatment of High Blood
   Pressure

AHA Diet and Lifestyle Recommendations **AHA** 





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## **AND NPG Rating System**

#### Each **Recommendation** rated as:

- Strong
- Fair
- Weak
- Consensus
- Insufficient Evidence

#### Each Recommendation Statement is:

 Conditional (applies to specific circumstances or subpopulation...if - then scenario)

Imperative (applies to target population...required, must, should)
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## Adults with type 1 and type 2 diabetes:

- Adult (19 to 44 yrs)
- Middle Age (45 to 64 yrs)
- Aged (65 to 79 yrs)
- Male and female





## **Effectiveness of Diabetes MNT**



INDICATOR	EXPECTED OUTCOME	WHEN TO EVALUATE		
BG Control		6 weeks to 3 months		
A1c	0.25 – 2.9%			
Plasma FG	50 - 100 mg			
Lipids 6 wks; if goals not met, intensify MNT, check in 6 weeks				
Total Chol	24 - 32 mg (10 - 13%)			
LDL-C	15 - 25 mg (12 - 16%)			
TG	15 - 17 mg (8%)			
HDL-C	No exercise: 3 mg (7%)			
	But with exercise: no			
BP	5 mm in systolic	Measured at every visit		
	2 mm in diastolic			

# Evidence-Based Interventions to Improve BG, Lipids, BP and Reduce Cardio-Metabolic Risk (CMR) in Adult Patients with Type 1 and Type 2 Diabetes are Summarized in: D.I.A.B.E.T.E.S. M.E.A.L. P.L.A.N. AADE16

A = Avoid sugar-sweetened
 beverages (BG, CMR, Wt)



 Consume <10% of kcal/day from added sugars





2015

# D = Divide daily calories into <u>>3</u> moderate meals or <u>>4</u> smaller meals (BG)





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D = Design individualized meal plan with foods to meet recommended dietary allowance/ dietary reference intake for all micronutrients (CMR)

 No clear evidence of benefit from supplementation in without deficiencies





 Supplementation of following to improve BG control NOT clearly demonstrated:

Chromium
Cinnamon
Herbs
Vitamin D







I = Increase plant stanols and sterols
 to 1.6 - 3 g/day (Lipids)

 Added to many common OTC foods such as margarines, yogurt, cereals, orange juice, etc.

Can also purchased in OTC capsules
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# I = Improve portion control (BG, Wt)







## After a 2 year loan to United States, Michelangelo's David being returned to Italy





# Look at what excess calories and no exercise has done to David!





A = Assess need for weight loss for overweight and obese PWDs (Wt, BG)

- In overwt and obese pts with T2 DM, modest wt loss (= sustained loss of 5% of initial wt):
  - Improves glycemic control
  - Reduces need for anti-glycemic medications





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- Sustained wt loss of 7% is optimal
- Wt loss can be attained with lifestyle programs to achieve:
  - Energy deficit of 500 750 kcal/day
  - Limit of 1200-1500 total kcal/day for women
  - Limit of 1500-1800 kcal/day for men

A = Acknowledge results of studies on sustained weight loss ≥1 year



Studies show that sustained weight loss interventions lasting ≥ 1 year had *inconsistent effects on A1C*, even though modest weight loss shown to improve insulin resistance in overweight and obese insulin-resistant persons.





### Why? Two Reasons\*

- Calorie deficit results in BG improvement almost immediately and before weight loss occurs, resulting in improved A1c....but, calorie deficit eliminated in wt maintenance
  - Seen in bariatric surgery: BG improves quickly before weight loss occurs

 Improvement may result from nutrients diverted away from GI tract and incompletely digested nutrients to ileum

\*The Dilemma of Weight Loss in Diabetes, Franz Marion J. MS, RD, LD, CDE, Diabetes Spectrum July '07 vol. 20 no. 3 133-136

- 2. In **early** stages of T2, **insulin resistance** predominant metabolic error, <u>not</u> insulin deficiency
  - Calorie deficit BG almost immediately in resistant phase
  - When T2 progresses from insulin resistance TO insulin deficiency, BG benefits of calorie deficit and weight loss
  - Treatment focus in insulin deficiency stage of T2:
    - Prevent weight gain
    - Combine meds (also insulin) with MNT
    - Seek BG control over weight control

A = Assure calorie intake is reduced if PWD is overweight or obese (BG, Lipids, Wt, CMR)



## THE BOTTOM LINE:

Eating less calories and getting regular physical activity improves BG control independent of body weight and weight loss. AADE16 A = Arrange meal plan/eating pattern that fits PWD's personal preferences, lifestyle, goals, etc. (BG, Wt)





Appreciate that there is:

No "one-size-fits-all" eating pattern





 Many acceptable eating patterns exist...example:

o Mediterranean-style

- MUFA-rich eating pattern can improve BG, CVD risk
- Can be recommended as effective alternative to *lower fat, higher-carb* plan



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### Another example:

## • Dietary Guidelines for Americans, 2015







B = Base macronutrient distribution on individualized assessment of current eating patterns, preferences, and metabolic goals (BG)

 There is no optimal mix of macronutrients or ideal % of calories as CHO, protein and fat for optimal BG control







# B = Boost viscous soluble fiber to 7 - 13 g/day (BG, Lipids, Wt)







## **Viscous Soluble Dietary Fiber in Foods**

FOOD SOURCE	VISCOUS SOLUBLE FIBER(G) <sup>1</sup>	TOTAL DIETARY FIBER (G)	
Fruit (1 medium)			
Apple	1	4	
Banana	1	3	
Blackberries (1/2 c)	1	4	
Nectarine	1	2	
Citrus fruit	1	2-3	
(orange, grapefruit)			
Peach	1	2	
Pears	2	4	
Plums	1	1.5	
Prunes	1.5	4	



FOOD SOURCE	VISCOUS SOLUBLE FIBER(G) <sup>1</sup>	TOTAL DIETARY FIBER (G)
Seeds Psyllium seeds, ground (1 tbsp)	5	6





E = Ensure that PWDs oninsulin-carb ratios subtract 50%
of dietary fiber that is  $\geq 5$  g on label from
Total Carbohydrate when estimating amount
of carb to be eaten at meals (BG)

Ensure same is done with sugar alcohol by examining food label



For PWDs on Insulin-Carb Ratio: When **Dietary Fiber** Is >5 g on Label, Subtract 50% of **Dietary Fiber g** From Total Carbohydrate When **Estimating Amount** of Carb Grams To Be Eaten at Meals

## **Nutrition Facts**

Serving Size 6.7 ounces (190 g) Servings Per Container 1

Amount Per Serving	8		
Calories 100	Ca	lories From	Fat 6
		% Daily	Value*
Total Fat 0.5g			1%
Saturated Fat 0	g		0%
Cholesterol Omg	3		0%
Sodium 11mg			0%
Total Carbohydr	ate 2	23g	8%
Dietary Fiber 5g	3	$\rightarrow$	21%
Sugars 18g			
Protein 0.5g			
Vitamin A 2%	•	Vitamin	C 4%
Calcium 1%	•	Iron 2%	b
* Percent Daily Value I	based	on a 2000 cal	orie diet.

"Net Carb", "Impact Carb" not defined by FDA. Created by companies to give products more shelf appeal

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For PWDs on Amount/Serving % Daily Value\* Insulin-Carb Ratio: Amount/Serving % Daily Value\* Nutrition When Facts Total Fat Og Total Carbohydrate 140 8% Sugar Alcohol Saturated Fat Oc 0% Dietary Fiber Og Serving Size: 5.3 (oz) Servings Per Container: 1 Trans Fat Og Is >5 g on Label, U UY Calories 115 Chalesterol Omo 0% Sugar Alcohol 9g Subtract 50% of Calories from Fat 0 Pluinin 15-Sodium 60mg \*Percent Daily Values Sugar Alcohol Grams from are based on a 2,000 Vitamin A 0% • Vitamin C 0% • Calcium 15% • Iron 0% calorie diet. Total INGREDIENTS: CULTURED PASTEURIZED NONFAT MILK, XYLITOL, BANAMA PUREE, CITRIC ACID, Carbohydrate ASCORBIC ACID, NATURAL FLAVORS, REB A, VEGETABLE RENNET, CONTAINS LIVE AND ACTIVE CULTURES. When Estimating T FOUND IN REGULAR NONFAT YOGURT. Amount of Carb Grams To Be Eaten at Meals



0%

T = Treat high blood pressure in PWDs:

For pts with BP <u>>120/80</u>, advise on:

- Lifestyle interventions to reduce BP

- For pts with BP  $\geq$  140/90, advise on:
  - Lifestyle interventions to reduce BP
  - Initiation + timely titration of Rx meds
- Measure BP at every healthcare visit
  - If elevated, confirm on separate day
### **BP Goals for PWDs and Rx Meds**



Goals	Lifestyle Interventions	Rx Meds
Without		Multiple-drug therapy
co-morbidities:	See	(incl. thiazide diuretic) and
S: <140 D: <90	next	ACE inhibitor OR
With co-morbidities:	slides	angiotensin receptor blocker at max doses generally required to
3. <130 D. <00		If using ACE inhibitors, ARBs or diuretics, then serum creatinine/estimated glomerular filtration rate and serum potassium levels

### Lifestyle Interventions to Reduce BP



Stop smoking

Limit Alcoholic drinks

Lose excess body weight

Engage in regular physical activity

Adhere to DASH Diet eating plan







- Lose Excess Body Wt
- Engage in Physical Activity



- Maintain normal wt (BMI 18.5 to 24.9)
- Lose excess body weight:
  - Wt loss of 10 kg can systolic BP by 5--20
- Exercise 30 min. per day, most days of week
- Limit alcohol per day:

•Men: <a>2</a> drinks (1 drink = 24 oz. beer, 10 oz. wine, 3 oz. whiskey)

OWomen and lighter-weight persons: <1 drink</li>
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### **Lifestyle Interventions**

### Reduce sodium per day for BP reduction to:

- 1500 2000 mg
- <2300 mg
- 1500 2400 mg
- <2400 mg



1500 mg desirable; associated w/ lower BP
 If Na level not achieved, by  $\leq$ 1000 mg
 1500 mg AHA AADE16

### Lifestyle Interventions



Minerals to Reduce BP	Amount Per Day in Foods	Food High In	Supplement/Day If Not In Foods
Potassium	2000 mg	Fruits, Vegetables	3700 mg
Calcium	<u>&gt;</u> 800 mg	Low Fat Dairy	1000 to 1500 mg
Magnesium	Dietary Reference Intakes (DRI): 310 - 420 mg for women & men 19 to >70 years old	Whole Grains, Green Leafy Veggies, Black Beans, Brown Rice, Nuts, Seeds, Fortified Foods (Cereals, Yogurts)	Up to 350 mg

### **DASH** Diet

- Encourages foods high in CA, K, Mg and fiber (or supplement)
- Limits sodium to 1500 2400 mg per day
- Limits fats consistent with *Therapeutic* Lifestyle Changes to blood cholesterol (low total fat, low saturated fat)
- Limits sweets



## In 2000 calorie DASH diet, aim for these servings daily:

- 7-8 servings of grains daily (3 = whole grains)
- 4 5 servings of fruits
- 4 5 servings of vegetables
- 2 3 servings of low-fat or nonfat dairy
- <2 servings of lean meat, fish, or poultry
- Weekly: 4 5 servings nuts, seeds, legumes

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E = Ensure carbohydrate amount per meal & snack individualized to meet BG target (BG)

- Carb foods, beverages and endogenous insulin = greatest determinant of post-meal BG
- Carb intake from whole grains, veggies, fruits, legumes, dairy products, with emphasis on high fiber and lower in glycemic load to be advised over other sources, esp. those
   Containing sugars

- Monitoring carb intake is key strategy to BG control via:
  - Carb counting or
  - Experience-based estimation (BG)







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**S** = Shrink saturated fat to <5-6% of kcal/day + replace with MUFA (CMR, Lipids, BG) 

 Decreases insulin resistance in pre-diabetes and T2 diabetes pts

Shrink saturated fat to <7% of kcal/day

Shrink trans fat to <1% of kcal/day

Shrink % of calories from trans fat









# Shrink saturated fat and trans fat (BG, Lipids, CMR)

### Shrink saturated fat to <10% of calories

### Limit trans fat



DGFA 2015





S = Shrink LDL-C and BP with further interventions (CMR, Lipids, BP)

- Consume **dietary pattern** that emphasizes intake of fruits, veggies, whole grains and:
  - Low fat dairy products
  - Poultry
  - Fish
  - Legumes
  - Non-tropical vegetable oils
  - Nuts

 Limit intake of added sugar foods and sugar-sweetened beverages







- Limit red meat
- Adapt this pattern to:
  - Calorie requirements
  - Culture
  - Personal food preferences
  - MNT for other dx's
- Achieve this pattern by following:
   DASH Diet
  - AHA Diet
  - **USDA** Food Pattern



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### **USDA Food Pattern**

http://www.cnpp.usda.gov/sites/default/files/usda\_foo d\_patterns/USDAFoodPatternsSummaryTable.pdf

#### **Daily Amount of Food From Each Group**

Calorie Level <sup>1</sup>	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Fruits <sup>2</sup>	1 cup	1 cup	1½ cups	1½ cups	1½ cups	2 cups	2 cups	2 cups	2 cups	2½ cups	2½ cups	2½ cups
Vegetables <sup>3</sup>	1 cup	1½ cups	1½ cups	2 cups	2½ cups	2½ cups	3 cups	3 cups	3½ cups	3½ cups	4 cups	4 cups
Grains <sup>4</sup>	3 oz-eq	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	10 oz-eq	10 oz-eq
Protein Foods <sup>5</sup>	2 oz-eq	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	5½ oz-eq	6 oz-eq	6½ oz-eq	6½ oz-eq	7 oz-eq	7 oz-eq	7 oz-eq
Dairy <sup>6</sup>	2 cups	2½ cups	2½ cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils <sup>7</sup>	15 g	17 g	17 g	22 g	24 g	27 g	29 g	31 g	34 g	36 g	44 g	51 g
Limit on calories from SoFAS <sup>8</sup>	137	121	121	121	161	258	266	330	362	395	459	596

### S = Substitute low-glycemic load foods for higher-glycemic load foods (BG)

### S = Shrink high sucrose foods to avoid displacing nutrient-rich foods (BG, Wt)



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### M = Make alcohol intake moderate (BP, BG, Wt)

- <1 drink/day for women</p>
- <u><</u>2 for men



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 Alcohol consumption may place PWD at increased risk for delayed hypoglycemia, especially if taking insulin or insulin secretagogues



### M = Make at least half of all grains whole grains (BP, BG, Lipids, Wt, CMR)







E = Ensure intake of antioxidant-rich fruits, nuts, veggies, whole grains (not supplements) (CMR, BG)

### **Oxidation reactions:**

- Leads to ⇒ free radicals
- ⇒ Oxidative stress (esp. CV system)
- ⇒ Cell damage
- Pre-mature aging



- High BG leads to:
- ➡ Glucose toxicity
- Glucose oxidation
- ⇒ Free radicals
- ⇒ Cell damage
- ⇒ Beta cell destruction





### **Dietary antioxidants that inhibit oxidation:**

- Vitamin A, C, E
- Beta carotene
- Lycopene
- Lutein
- Polyphenols
- CoQ10
- Selenium
- Flavonoids
- Flavones
- Flavonols
- Green tea
- Proanthocyanidins



E = Ensure you are not recommending high doses of supplemental anti-oxidant vitamins E, C, ß-carotene for CVD

- Per research:
  - High doses (above Recommended Dietary Allowance) do not provide CV benefit

-May cause harm (incl. more cell damage)

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-May even shorten life span

• Per research:

Supplemental vitamin C, E, ß-carotene & selenium should not be taken with simvastatin-niacin drug combination

Combination may lower HDL<sub>2</sub>-C, a beneficial subfraction of HDL-C

Strong, Imperative



- **E** = Encourage intake of foods that contain:
  - Plant omega 3 fats (ALA or alpha-linolenic acid)
  - Marine omega 3 fats (EPA, DHA)

### Also:



Encourage intake of n3 fish, 2 - 3x/week right.
 (Lipids, CMR)



E = Evaluate carefully the mixed recommendations on omega 3 supplementation (CMR):

- •Evidence does **not** support EPA DHA refined oil supplements (ROSs) for PWDs for prevention or treatment of CVD
- But: ROSs shown to be equally effective as fish at ↑ tissue levels of EPA - DHA







But: per ADA, eating foods rich in long-chain omega-3 fats recommended to prevent or treat CVD (CMR):

- Fatty fish (EPA DHA)
- Nuts
- Seeds (ALA)







Evidence does **not** support a beneficial role for **omega-3 dietary supplements** 



Patients without documented CHD	Eat variety of (preferably fatty) fish at least twice a week. Include oils and foods rich in alpha-linolenic acid (flaxseed, canola and soybean oils; flaxseed and walnuts).
Patients with documented CHD	Consume about 1 g of EPA + DHA/day, preferably from fatty fish. EPA + DHA in capsule form could be considered in consultation with the physician.
Patients who need to triglycerides	2 - 4 g of EPA + DHA/day provided as capsules under physician's care.



### A = Assure consistent timing and even spacing of meals and carbohydrate intake (BG)







A = Assure priority given to coordinating food with dose and type of anti-diabetes medicine (BG)

















- If on insulin secretagogues:
  - Eat moderate amounts of carb at meals and snacks





T1/T2 PWDs on mealtime insulin:



- Assure priority given to coordinating food with dose and type of anti-diabetes medicine
- On **fixed** daily insulin doses:
  - Assure meal plan emphasizes relatively fixed:

Meal and snack times and
Carb intake





L = Learn that fructose consumed as "free fructose" (naturally occurring in foods such as fruit) (BG):

- May result in better glycemic control compared with isocaloric intake of:
  - Sucrose
  - Starch

 Fructose not likely to have detrimental effects on triglycerides as long as intake not excessive (>12% energy) P = Provide lean protein for health, 15 - 19% of kcal, or 0.8 g/kg body weight/day without renal co-morbidities (BG, Wt)

- T2 DM: this amount has NO significant effect on BG
- T1 DM: effect on BG is less clear

Protein does NOT significantly slow
 absorption of carb food



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 Adding protein to carbohydrate food treatment for hypoglycemia NOT shown to treat or prevent hypoglycemia



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 Evidence inconclusive to recommend ideal amount of protein to optimize BG or improve ≥1 CVD risk measures



L = Lower total fat to 20 - 35% of calories (CMR, Wt)

L = Let fat quality be more important than quantity; replace SFA w/ MUFA, PUFA (CMR, BG, Lipids)

L = Let total fat amount be individualized for PWDs; evidence inconclusive for ideal amount of







A = Allow PWDs to consume non-nutritive sweeteners as can decrease calorie and carbohydrate intake when substituted for caloric sweeteners (BG, Wt, CMR)





N = Nibble on nuts, 5 oz./week, especially walnuts, pecans, almonds, pistachios; best to isocalorically incorporate daily consumption for wt control (Lipids, CMR)






N = Notify non-insulin PWDs that it is not required to subtract dietary fiber or sugar alcohols from Total Carbohydrate on label when carb counting at meals & snacks (BG)

Sugar alcohols (2 calories/g):

- Sorbitol
- Xylitol
- Mannitol
- Isomalt
- Maltitol, Lactitol
- Hydrogenated starch hydrolysates



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## You expect me to remember all this stuff?





I've learned that I must learn the newest methods, processes and technologies, so that both I, and my patients, land on our feet the first time and every time!



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## **BOTTOM LINE:**

## LIFESTYLE AFFECTS DIABETES!



"Our health always seems much more valuable after we lose it."

~Author Unknown

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