Evidence-Based Nutrition Practice Guidelines, Recommendations and Interventions to Control the A-B-C’s of T1 and T2 Diabetes in Adults

Learning Objectives
1. Name the 3 primary clinical outcomes (goals) for diabetes MNT and the current target values.
2. 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.

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*
- Standards of Medical Care in Diabetes, 2016* American Diabetes Association
* Date of last update when accessed online on June 12, 2016

Disclosure to Participants
- Notice of Requirements For Successful Completion
  - 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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  - Mary Ann Hodorowicz will not discuss any off-label use of OTC or prescription drugs.
- Activity-Type:
  - Knowledge-based
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


Dietary Guidelines for Americans 2015

7th Report of the Joint National Treatment of High Blood Pressure

AHA Diet and Lifestyle Recommendations

AND NPG Rating System

Each Recommendation rated as:

- Strong
- Fair
- Weak
- Consensus
- Insufficient Evidence

Each Recommendation Statement is:

- Conditional (applies to specific circumstances or sub-population... if - then scenario)
- Imperative (applies to target population...required, must, should)

Target Population for AND Diabetes NPG

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

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:

A. D.I.A.B.E.T.E.S.

M.E.A.L. P.L.A.N.
D = Divide daily calories into ≥3 moderate meals or ≥4 smaller meals (BG)

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

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

I = Improve portion control (BG, Wt)

• Supplementation of following to improve BG control NOT clearly demonstrated:
  o Chromium
  o Cinnamon
  o Herbs
  o Vitamin D

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

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.

Strong, Conditional

Why? Two Reasons*

1. 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

*A 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, not 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:
     o Prevent weight gain
     o Combine meds (also insulin) with MNT
     o Seek BG control over weight control

- 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
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.

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

Dietary Guidelines for Americans, 2015

- No "one-size-fits-all" eating pattern
- Many acceptable eating patterns exist...
- Mediterranean-style
  - MUFA-rich eating pattern can improve BG, CVD risk

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

Boost total fiber

Boost viscous soluble fiber to 7 - 13 g/day (BG, Lipids, Wt)
Viscous Soluble Dietary Fiber in Foods

For PWDs on Insulin-Carb Ratio:
- When Dietary Fiber is \( \geq 5 \) g on Label, Subtract 50% of Dietary Fiber g From Total Carbohydrate
- When Estimating Amount of Carb Grams to Be Eaten at Meals

<table>
<thead>
<tr>
<th>FOOD SOURCE</th>
<th>VISCOSOUS SOLUBLE FIBER (g)</th>
<th>TOTAL DIETARY FIBER (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit (1 medium)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Banana</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Blackberries (1/2 c)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Nectarine</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Citrus fruit (orange, grapefruit)</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Peach</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pears</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Plums</td>
<td>3.5</td>
<td>4</td>
</tr>
<tr>
<td>Prunes</td>
<td>1.5</td>
<td>4</td>
</tr>
</tbody>
</table>

Ensure that PWDs on insulin-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 Sugar Alcohol Is \( \geq 5 \) g on Label, Subtract 50% of Sugar Alcohol Grams from Total Carbohydrate
- When Estimating Amount of Carb Grams to Be Eaten at Meals

<table>
<thead>
<tr>
<th>FOOD SOURCE</th>
<th>VISCOSOUS SOLUBLE FIBER (g)</th>
<th>TOTAL DIETARY FIBER (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psyllium seeds, ground (1 tbsp)</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Treat high blood pressure in PWDs:
- For pts with BP \( \geq 120/80 \), 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

<table>
<thead>
<tr>
<th>Goals</th>
<th>Lifestyle Interventions</th>
<th>Rx Meds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without co-morbidities:</td>
<td>See next slides</td>
<td>Multiple-drug therapy (incl. thiazide diuretic) and ACE inhibitor OR</td>
</tr>
<tr>
<td>S: &lt;140 D: &lt;90</td>
<td></td>
<td>angiotensin receptor blocker at max doses generally required to meet BP targets.</td>
</tr>
<tr>
<td>With co-morbidities:</td>
<td></td>
<td>If using ACE inhibitors, ARBs or diuretics, then serum creatinine/estimated glomerular filtration rate and serum potassium levels should be monitored.</td>
</tr>
<tr>
<td>S: &lt;130 D: &lt;80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 ≤1000 mg
  - <1500 mg

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

Lifestyle Interventions

**Minerals to Reduce BP**

<table>
<thead>
<tr>
<th>Minerals to Reduce BP</th>
<th>Amount Per Day in Foods</th>
<th>Food High In</th>
<th>Supplement/Day If Not In Foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>2000 mg</td>
<td>Fruits, Vegetables</td>
<td>3700 mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>≥800 mg</td>
<td>Low Fat Dairy</td>
<td>1000 to 1500 mg</td>
</tr>
<tr>
<td>Magnesium</td>
<td></td>
<td>Whole Grains, Green Leafy Veggies, Black Beans, Brown Rice, Nuts, Seeds, Fortified Foods (Cereals, Yogurts)</td>
<td>Up to 350 mg</td>
</tr>
</tbody>
</table>

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

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

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

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

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

**USDA Food Pattern**
http://www.cnpp.usda.gov/sites/default/files/usda_food_patterns/USDAFoodPatternsSummaryTable.pdf

<table>
<thead>
<tr>
<th>Daily Amount of Food from Each Group</th>
<th>1,000</th>
<th>1,200</th>
<th>1,400</th>
<th>1,600</th>
<th>1,800</th>
<th>2,000</th>
<th>2,200</th>
<th>2,400</th>
<th>2,600</th>
<th>2,800</th>
<th>3,000</th>
<th>3,200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grains</strong></td>
<td>3 cups</td>
<td>4 cups</td>
<td>5 cups</td>
<td>6 cups</td>
<td>7 cups</td>
<td>8 cups</td>
<td>9 cups</td>
<td>10 cups</td>
<td>11 cups</td>
<td>12 cups</td>
<td>13 cups</td>
<td>14 cups</td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td>2 cups</td>
<td>3 cups</td>
<td>4 cups</td>
<td>5 cups</td>
<td>6 cups</td>
<td>7 cups</td>
<td>8 cups</td>
<td>9 cups</td>
<td>10 cups</td>
<td>11 cups</td>
<td>12 cups</td>
<td>13 cups</td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td>2 cups</td>
<td>3 cups</td>
<td>4 cups</td>
<td>5 cups</td>
<td>6 cups</td>
<td>7 cups</td>
<td>8 cups</td>
<td>9 cups</td>
<td>10 cups</td>
<td>11 cups</td>
<td>12 cups</td>
<td>13 cups</td>
</tr>
<tr>
<td><strong>Dairy</strong></td>
<td>3 g</td>
<td>4 g</td>
<td>5 g</td>
<td>6 g</td>
<td>7 g</td>
<td>8 g</td>
<td>9 g</td>
<td>10 g</td>
<td>11 g</td>
<td>12 g</td>
<td>13 g</td>
<td>14 g</td>
</tr>
<tr>
<td><strong>Limit sodium from total</strong></td>
<td>137</td>
<td>113</td>
<td>121</td>
<td>131</td>
<td>141</td>
<td>151</td>
<td>161</td>
<td>171</td>
<td>181</td>
<td>191</td>
<td>201</td>
<td>211</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M = Make alcohol intake moderate (BP, BG, Wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ≤1 drink/day for women</td>
</tr>
<tr>
<td>• ≤2 for men</td>
</tr>
<tr>
<td>• Alcohol consumption may place PWD at increased risk for <strong>delayed hypoglycemia</strong>, especially if taking insulin or insulin secretagogues</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E = Ensure intake of antioxidant-rich fruits, nuts, veggies, whole grains (not supplements) (CMR, BG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidation reactions:</td>
</tr>
<tr>
<td>Leads to ⇒ free radicals</td>
</tr>
<tr>
<td>⇒ Oxidative stress (esp. CV system)</td>
</tr>
<tr>
<td>⇒ Cell damage</td>
</tr>
<tr>
<td>⇒ Pre-mature aging</td>
</tr>
</tbody>
</table>
**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
- Procyanidins

**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 (Lipids, CMR)

**E = Ensure you are not recommending high doses of supplemental anti-oxidant vitamins E, C, β-carotene for CVD prevention and treatment**
- Per research:
  - High doses (above Recommended Dietary Allowance) do not provide CV benefit
  - May cause harm (incl. more cell damage)
  - May even shorten life span

**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

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**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.

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

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**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

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**If on insulin secretagogues:**

- Eat moderate amounts of carb at meals and snacks
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)  AADE16

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  AADE16

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)
• Adding protein to carbohydrate food treatment for hypoglycemia NOT shown to treat or prevent hypoglycemia
• Evidence inconclusive to recommend ideal amount of protein to optimize BG or improve >1 CVD risk measures  AADE16

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  AADE16
**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

**BOTTOM LINE:**
**LIFESTYLE AFFECTS DIABETES!**

“Our health always seems much more valuable after we lose it.”
~Author Unknown

**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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