Treating diabetes from a provider perspective involves using a combination of nutrition, lifestyle and medications to manage hemoglobinA1c, blood pressure and cholesterol –the ABCs of diabetes control. The nutrition and lifestyle evidence emphasizes different priorities for managing glycemia in patients with type 1 versus type 2 diabetes. This session will review the evidence based nutrition guidelines for managing the ABCs of diabetes control and considerations for translating research to practice from both a patient and provider perspective. To maximize effectiveness, the nutrition and lifestyle plan needs to be evidence based and tailored to the clinical profile, eating habits and lifestyle, motivation and learning capabilities of each person. Medical nutrition therapy is the process by which dietitians translate the evidence based nutrition priorities into an action plan that patients can follow. Diabetes treatment teams can improve patients’ self-efficacy for managing diet and lifestyle by taking the following action steps: (1) aim for consistency in clinical message priorities, (2) evaluate readiness and motivation for weight loss or other nutrition and lifestyle change and (3) refer patients to evidence-based lifestyle change programs to work on weight loss and increased activity or for individualized medical nutrition therapy.

References:

Improving Diabetes Outcomes through Nutrition and Lifestyle Change—Translating Research to Practice

Linda M. Delahanty, MS, RDN, LDN
Chief Dietitian, Diabetes Clinic
Director of Nutrition and Behavioral Research
Massachusetts General Hospital Diabetes Center
Boston, Massachusetts

Objectives

1. Discuss the nutrition and lifestyle evidence related to improved diabetes outcomes
2. Discuss translation of nutrition and lifestyle research to practice from both a patient and provider perspective

ADA Recommendations for Glycemic, Blood Pressure and Lipid Control

<table>
<thead>
<tr>
<th>Diabetes Control</th>
<th>Treatment Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>7% or less</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>&lt;140/90 mmHg</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>LDL &lt; 100 mg/dL; &lt; 70 mg/dL with overt CVD</td>
</tr>
<tr>
<td></td>
<td>HDL &gt; 40 mg/dL in men; &gt;50 mg/dL in women</td>
</tr>
<tr>
<td></td>
<td>Triglyceride levels &lt; 150 mg/dL</td>
</tr>
</tbody>
</table>

Standards of Medical Care in Diabetes-2015. Diabetes Care 2015;38(Suppl 1):S1-S87

Approximate LDL-C Reduction Achievable by Dietary Modification

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Dietary Change</th>
<th>Approximate LDL Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturated fat</td>
<td>&lt;7% of calories</td>
<td>8-10</td>
</tr>
<tr>
<td>Dietary cholesterol</td>
<td>&lt;200 mg/day</td>
<td>3-5</td>
</tr>
<tr>
<td>Weight reduction</td>
<td>Lose 10 lbs</td>
<td>5-8</td>
</tr>
<tr>
<td>Other LDL lowering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscous fiber</td>
<td>5-10 g/day</td>
<td>3-5</td>
</tr>
<tr>
<td>Plant sterol/stanol esters</td>
<td>2 g/day</td>
<td>5-15</td>
</tr>
<tr>
<td>Cumulative estimate</td>
<td></td>
<td>20-30</td>
</tr>
</tbody>
</table>


Approximate SBP Reduction Achievable by Lifestyle Modification

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Dietary Change</th>
<th>Approximate SBP Reduction (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>Lose 10 kg</td>
<td>5-20</td>
</tr>
<tr>
<td>DASH eating plan</td>
<td>↑ Fruits, vegetables, low fat dairy; ↓ saturated and total fat</td>
<td>8-14</td>
</tr>
<tr>
<td>Dietary sodium</td>
<td>2400 mg/day</td>
<td>2-8</td>
</tr>
<tr>
<td>Moderation of alcohol</td>
<td>≤2 drinks/day (men); ≤1 drink/day (women)</td>
<td>2-4</td>
</tr>
<tr>
<td>Physical activity</td>
<td>30 minutes/day aerobic</td>
<td>2-4</td>
</tr>
<tr>
<td>Cumulative estimate</td>
<td></td>
<td>19-50</td>
</tr>
</tbody>
</table>


Presenter Disclosure Information

Linda Delahanty MS, RDN:
Advisory Panel:
• Eli Lilly and Company
• Nutrisystem, Inc
• Janssen Pharmaceuticals
• Omada Health
Consultant:
• JanaCare
### Type 1 Diabetes

**Dietary Component** | **Recommendations**
--- | ---
Carbohydrate counting meal planning approach | Consistent carbohydrate adjustment
Diet behaviors | 6 diet behaviors associated with lower HbA1c
Sugar sweetened beverages | Limit or avoid
Saturated fat | <10% of total calories
Trans fat | Minimize
Moderation of alcohol | ≤2 drinks for men; ≤1 drink for women


### Dietary Behaviors Associated with Lower HbA1c in the DCCT

- Adherence to diet
- Adjusting insulin for variations in food intake
- Prompt treatment of hyperglycemia
- Avoiding overtreatment of hypoglycemia
- Avoiding extra snacks
- Consistency in night snacks

*Delahanty L and Halford B, Diabetes Care 1993; 16(11):1453.*

### Prediabetes and Type 2 Diabetes

**Dietary Component** | **Recommendations**
--- | ---
Weight reduction | Lose 7% body weight
Physical activity | 150 minutes/week
Sugar sweetened beverages | Limit or avoid
Saturated fat | <10% of total calories
Trans fat | Minimize
Moderation of alcohol | ≤2 drinks for men; ≤1 drink for women


### DPP: Incidence of Developing Type 2 Diabetes

**Overall risk reduction:**
- **Lifestyle:** 58%
- **Metformin:** 31%

**Cumulative Incidence (%):**
- Placebo: 11%/year
- Metformin: 7.8%/year*
- Lifestyle: 4.8%/year*


### Effect of Weight Loss with Lifestyle Intervention on Diabetes Prevention

- Weight loss was the dominant predictor of diabetes prevention
- For every Kg of weight loss, diabetes risk was reduced by 16%
- If weight loss goal not achieved, meeting activity goal reduced risk of developing diabetes by 44%


### The Look AHEAD Trial

**11.5-year randomized multicenter trial**

- **Lifestyle intervention:**
  - Goal: 7% of body weight
  - 1200-1800 kcal/day
  - Meal replacements
  - Diabetes education and follow up
- **Diabetes support and education:**
  - Regular support and education
  - Diabetes education and follow up

**Primary outcome:** CVD death, MI, stroke, hospitalized angina

**Look AHEAD: 1-Year Results**

- **Weight Loss**
  - Body Weight (%)
  - HbA1c <7%
  - BP <130/80 mmHg
  - LDL-C <100 mg/dL
  - All 3 Goals

- **Goal Attainment**
  - P < .001
  - P < .001
  - P < .001

* *Lifestyle intervention included use of liquid meal replacement shakes and meal bars and increased physical activity. DSE = diabetes support and education.*


**Effect of Meal Replacement Use with Lifestyle Intervention on Weight Loss**

- Highest quartile of meal replacements use (~12 MR/week) had average weight loss of 11.2%
- Lowest quartile of use (~2 MR/week) lost 5.9% of initial weight
- Participants in the highest quartile of meal replacement use had 4.1 times greater odds of reaching a 10% weight loss


**Look AHEAD: Cumulative Hazard for Primary Outcome**


**Benefits of lifestyle intervention compared to diabetes support and education**

- HbA1c
- Blood pressure
- Triglycerides
- Number of medications
- Medication costs
- C-reactive protein
- Retinopathy
- Nephropathy
- Remission of diabetes
- Fewer hospitalizations
- Sleep apnea
- Fatty liver
- Sexual dysfunction
- Urinary incontinence
- Physical function
- Knee pain
- Quality of life
- Depression
- Body image dissatisfaction

**Lifestyle Intervention**

- Nutrition: Fat and calorie goals based on initial weight
- Activity: 150-175 minutes activity/week
- Behavioral strategies teach lifestyle skills
  - Self-monitoring
  - Goal-setting
  - Stimulus control
  - Problem-solving
  - Relapse prevention
  - Cognitive restructuring


**Assess Readiness for Lifestyle Change at Each Visit**

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Patient seeks weight reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress level</td>
<td>Free of major life crises</td>
</tr>
<tr>
<td>Psychiatric issues</td>
<td>Free of severe depression, eating disorders, substance abuse</td>
</tr>
<tr>
<td>Time availability</td>
<td>Patient can devote 15-30 minutes/day to weight control for next 26 weeks</td>
</tr>
</tbody>
</table>

**YES**
- Patient Ready?
- Prioritize focus on “how” to make lifestyle changes to lose weight and increase activity

**NO**
- Prevent weight gain, explore weight loss barriers, increase activity, healthy eating
Mediterranean vs Low-Fat Diets

- Meta-analysis including 6 RCTs of 3650 overweight/obese patients with at least 1 CVD risk factor and 2 year follow up
- Mediterranean diet had more favorable weighted mean differences in:
  - Body weight (2.2 kg)
  - BMI (-0.6 kg/m2)
  - SBP (-1.7 mm Hg)
  - DBP (-1.5 mm Hg)
  - FPG (-3.8 mg/dL)
  - Total cholesterol (-7.4 mg/dL)
  - High sensitivity CRP (-1.0 mg/L)


Primary Prevention of CVD with a Mediterranean Diet

- 7447 patients at high risk for CVD randomly assigned to:
  - Mediterranean diet (with > 4 tbsp/day extra virgin olive oil)
  - Mediterranean diet (with 30g mixed nuts)
  - Low fat diet advice (control group)
- After 4.8 years follow up, the energy unrestricted Mediterranean diets:
  - Resulted in a 30% reduction in the composite outcome of MI, stroke and death from CVD events
  - 39% reduction in risk of stroke
  - No significant reduction in MI alone

Estruch R et al. NEJM 2013; Feb 25 NEJM.org

Primary Prevention of CVD with a Mediterranean Diet

- Baseline diets: ~39% fat, 10% sat fat, 19.5% MUFA, 6.2% PUFA, 360 mg cholesterol
- At study end: Mediterranean diet group significantly increased weekly servings of olive oil, nuts, legumes and fish more than low fat diet group

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Mediterranean diet Extra Oil</th>
<th>Mediterranean diet Nuts</th>
<th>Low fat diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat (%)</td>
<td>41.2</td>
<td>41.5</td>
<td>37</td>
</tr>
<tr>
<td>Sat fat (%)</td>
<td>9.4</td>
<td>9.3</td>
<td>9.1</td>
</tr>
<tr>
<td>MUFA (%)</td>
<td>22.1</td>
<td>20.9</td>
<td>18.6</td>
</tr>
<tr>
<td>PUFA (%)</td>
<td>6.1</td>
<td>7.7</td>
<td>5.5</td>
</tr>
<tr>
<td>Chol (mg)</td>
<td>339</td>
<td>338</td>
<td>325</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>25.4</td>
<td>27.0</td>
<td>23.7</td>
</tr>
</tbody>
</table>

Estruch R et al. NEJM 2013; Feb 25 NEJM.org

What Diet Works Best to Prevent Weight Gain?

- 2012 systematic review of role of macronutrient, food, and dietary patterns in predicting weight
- Probable evidence
  - High intake of meat predicted more weight gain
  - High intake of fiber and nuts predicted less weight gain
- Suggestive evidence
  - Intake of whole grains, cereal fiber, high-fat dairy products, and prudent diet protected against weight gain
  - High intake of refined grains, sweets, and desserts predicted more weight gain


Healthy Dietary Practices

<table>
<thead>
<tr>
<th>Optimal Behaviors</th>
<th>Prevalence in the United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt;25 kg/m²</td>
<td>33%</td>
</tr>
<tr>
<td>4-5 cups vegetable and fruit/day</td>
<td>12%</td>
</tr>
<tr>
<td>Three 3.5-oz serving whole grains/day</td>
<td>7%</td>
</tr>
<tr>
<td>Two 3.5-oz serving fish/week</td>
<td>18%</td>
</tr>
<tr>
<td>&lt;7% of calories from saturated fat</td>
<td>9%</td>
</tr>
<tr>
<td>&lt;300 mg cholesterol/day</td>
<td>39% of men; 79% of women</td>
</tr>
<tr>
<td>Drink &lt;450 calories from sugar/week</td>
<td>52%</td>
</tr>
<tr>
<td>&lt;1500 mg sodium/day</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

BMI = body mass index.

Why is nutrition so confusing?

- Optimal Behaviors
  - BMI <25 kg/m²
  - 4-5 cups vegetable and fruit/day
  - Three 3.5-oz serving whole grains/day
  - Two 3.5-oz serving fish/week
  - <7% of calories from saturated fat
  - <300 mg cholesterol/day
  - Drink <450 calories from sugar/week
  - <1500 mg sodium/day

- Prevalence in the United States
  - 33%
  - 12%
  - 7%
  - 18%
  - 9%
  - 39% of men; 79% of women
  - 52%
  - <1%
There are too many dietary behaviors to focus on.

Medical Nutrition Therapy

• the process by which the registered dietitian-nutritionist (RDN) tailors a nutrition plan for people with diabetes based on medical, lifestyle, and personal factors.

RCTs of MNT have shown decreases in A1c:
- 1% in patients with type 1 DM
- 2% in newly diagnosed patients with type 2 DM
- 1% in type 2 patients with average duration of 4 yrs


Diabetes Self Care Behaviors

• Incorporate nutritional management
• Incorporate physical activity
• Taking medication (safely and effectively)
• Monitoring blood glucose
• Diabetes self-care-related problem solving
• Preventing, detecting and treating acute and chronic complications
• Developing personal strategies to address psychosocial issues and concerns
• Developing personal strategies to promote health and behavior change

Diabetes Care 2014; 37(Suppl 1): S144-S153

What do patients with diabetes want?

• Better health outcomes
• Less medication
• Better quality of life
• Ability to enjoy eating

And the “know how” to achieve it!
**What’s the “Take Home”**

**Prediabetes and Type 2 Diabetes**

- Losing 5% to 10% of body weight improves the ABCs of diabetes control and many other diabetes-related outcomes
- Meal replacements can enhance weight loss results
- Minimize or avoid sugar sweetened beverages and fruit juices
- If not ready to lose weight, then goal is to prevent weight gain, increase activity, and focus on healthy eating
- Mediterranean dietary pattern appears to reduce blood glucose and CVD risk factors and lower combined end-points for CVD and stroke; there is no “ideal” conclusive eating pattern

---

**Type 1 Diabetes**

- Focus on consistent carbohydrate intake for those on fixed insulin regimens
- Focus on matching insulin to carbohydrate intake for those on flexible insulin regimens
- Minimize or avoid sugar sweetened beverages and fruit juices
- Focus on diet behaviors associated with improved glycemic control
- Teach patients to interpret diet, activity, insulin and blood glucose relationships

---

**Translating Nutrition and Lifestyle Research to Practice**

- Consider nutrition and lifestyle priorities for type 1 vs type 2 diabetes
- Simplify clinical messaging priorities
- Be consistent in clinical messaging among team members
- Assess readiness for nutrition and lifestyle change
- Integrate referrals for medical nutrition therapy
- Refer to diabetes self-management programs
- Refer to lifestyle change programs

---

**What’s the “Take Home”**

- Nutrition and lifestyle advice needs to be *tailored* based on an assessment of each patient’s diet history and preferences, motivation to change, and clinical profile
- Patients need to learn not only what to eat, but how to eat in a way that is sustainable
- Changing eating habits involves learning behavioral skills of self monitoring, goal setting, problem solving, managing lapses, and negative self talk
- *One diet approach does not fit all*
- *One MNT visit does not fix all*
- *Lifestyle programs are not a fit for everyone*