MARY ANN HODOROWICZ, RD, MBA, CDE, CERTIFIED ENDOCRINOLOGY CODER

Evidence-Based Nutrition Practice Guidelines, Recommendations and Interventions for T1 and T2 Diabetes in Adults
8-3-15

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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  - Participants will be notified by speakers to any product used for a purpose other than for which it was approved by the Food and Drug Administration.

Main References and Associated Symbols

- Academy of Nutrition and Dietetics (AND) Diabetes Nutrition Practice Guideline (NPG) 2008*
- 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 and Dietetics, Jan. 2014 Vol.114, No.1
- Standards of Medical Care in Diabetes, 2015*
  American Diabetes Association
- 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

* Date of last update when accessed online on Aug. 1, 2015
** Version available as of June 9, 2015

• Dietary Guidelines for Americans 2010

ADA Recommendations: MNT

• Individuals who have pre-diabetes or diabetes should receive individualized MNT as needed to achieve treatment goals, preferably provided by a registered dietitian familiar with components of diabetes MNT.

• Because MNT can result in cost-savings and improved outcomes, MNT should be adequately covered by insurance and other payers.

ADA Recommendations: DSME and Support

• People with diabetes should receive DSME according to National Standards for Diabetes Self-Management Education and Support at dx and as needed after.

• Effective self-management, quality of life are key outcomes of DSME; should be measured, monitored as part of care

• DSME should address psychosocial issues, since emotional well-being is associated with positive outcomes

ADA Recommendations: Change System of Care

• Most successful practices have an institutional priority for providing high quality of care:
  – Basing care on evidence-based guidelines
  – Expanding the role of teams and staff
  – Redesigning the processes of care
  – Implementing electronic health record tools
  – Activating and educating patients
  – Identifying and/or developing community resources and public policy that supports healthy lifestyles

Implementation of MNT by RD

• Series of 3–4 encounters with RD lasting 45–90 min.
• Encounters should begin at dx of diabetes or at 1st referral to RD for MNT for diabetes and completed within 3–6 months
  o RD to determine whether additional MNT needed
• ≥1 follow-up encounter recommended annually to reinforce lifestyle changes and to evaluate and monitor outcomes that indicate need for changes in MNT or medication(s)
  o RD to determine whether additional MNT needed

AND Evidence-Based Nutrition Practice Guideline Defined

• Series of guiding statements and treatment algorithms developed using systematic process for identifying, analyzing and synthesizing scientific evidence.

• Assist practitioner’s and patient’s decisions about appropriate nutrition care for specific disease states or conditions in typical settings.
AND NPGs and Nutrition Care Process (NCP)

- Nutrition Care Process is framework for NPG:
  - Nutrition Assessment
  - Nutrition Diagnosis
  - Nutrition Interventions
  - Monitoring and Evaluation
  - Of outcomes (knowledge, skill, behavior, clinical, cost-savings, quality of life, satisfaction (pecking order!)

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

MNT Spelled Backwards = TNM
Total Nutrition Makeover

Managing and Maintaining a nutrition Makeover Means Modifying behaviors, which Means More than 1 visit over several Months

ADA Clinical Goals for Adult Patients with Diabetes

<table>
<thead>
<tr>
<th>GOALS</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>&lt;7%</td>
</tr>
<tr>
<td>Pre-Meal</td>
<td>80 – 130 mg/dL</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>&lt;140/90 mmHg</td>
</tr>
<tr>
<td>LDL-C</td>
<td>&lt;100 mg/dL</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>&lt;150 mg/dL</td>
</tr>
<tr>
<td>HDL-C</td>
<td>&gt;40 mg/dL for men, &gt;50 mg/dL for women</td>
</tr>
<tr>
<td>Body weight</td>
<td>Achieve and maintain goals</td>
</tr>
<tr>
<td>Diabetes complications</td>
<td>Delay or prevent complications</td>
</tr>
</tbody>
</table>

Standards of Medical Care in Diabetes, Diabetes Care 2015
ADA GOALS, Continued

- Address individual nutrition needs based on:
  - Personal and cultural preferences
  - Health literacy and numeracy
  - Access to healthful food choices
  - Willingness
  - Ability to make behavioral changes
  - Barriers to change

- Maintain pleasure of eating by:
  - Providing positive messages about food choices
  - Limiting food choices only per scientific evidence

- Provide practical tools for day-to-day meal planning rather focusing on individual:
  - Macronutrients (carb, protein, fat)
  - Micronutrients
  - Single foods

ADA Diagnostic Criteria for Diabetes

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Expected Outcome</th>
<th>When to Evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPG</td>
<td>100 – 125 mg</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>(Impaired Fasting Glucose)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 126 mg*</td>
<td></td>
</tr>
<tr>
<td>Random Plasma Glucose</td>
<td>≥ 200 mg w/ symptoms of high BG</td>
<td></td>
</tr>
<tr>
<td>2 hr OGTT (plasma)</td>
<td>140 – 199 mg</td>
<td>Pre-Diabetes</td>
</tr>
<tr>
<td>75 g glucose in water</td>
<td>≥ 200 mg*</td>
<td></td>
</tr>
<tr>
<td>A1C</td>
<td>≤ 5.7%</td>
<td>Diabetes</td>
</tr>
<tr>
<td></td>
<td>5.7% to 6.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 6.5%*</td>
<td></td>
</tr>
</tbody>
</table>

*A in absence of unequivocal hyperglycemia, test to be confirmed by repeat testing.

Standards of Medical Care in Diabetes, Diabetes Care 2015

Effectiveness of Diabetes MNT

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Expected Outcome</th>
<th>When to Evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>BG Control</td>
<td>0.25 – 2.9% ↓</td>
<td>6 weeks to 3 months</td>
</tr>
<tr>
<td>A1c</td>
<td>50 – 100 mg ↓</td>
<td>6 weeks; if goals not met, intensify MNT, check in 6 weeks</td>
</tr>
<tr>
<td>Lipids</td>
<td>24 – 32 mg (10 – 13%) ↓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 – 25 mg (12 – 18%) ↓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 – 17 mg (8%) ↓</td>
<td></td>
</tr>
<tr>
<td>Total Chol</td>
<td>No exercise: 3 mg (7%) ↓</td>
<td>Measured at every visit</td>
</tr>
<tr>
<td>LDL</td>
<td>But with exercise: no ↓</td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>BP</td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td>3 mm ↓ in systolic; 2 mm ↓ in diastolic</td>
<td></td>
</tr>
</tbody>
</table>

S.W.E.E.T.S. are Your Diabetes L.I.F.E. savers

S = Stress Control
W = Weight Control
E = Eat Healthy
E = Exercise
T = Take Diabetes Meds, If Required
S = Self-monitor blood glucose for
L = Learn to Reduce Risks
I = Invest in Long-Term Support
F = Fix Your Problems
E = Enjoy Adequate Sleep
Nutrition Assessment: 1st Step in AND Nutrition Care Process

Assessment to Include Waist Circumference Measurement and Evaluation:
CVD Disease Risk Associated with BMI > Waist Size

<table>
<thead>
<tr>
<th>BMI</th>
<th>CVD Risk per Waist:</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤18.5</td>
<td>Underwt N/A</td>
</tr>
<tr>
<td>18.5 - 24.9</td>
<td>Normal N/A</td>
</tr>
<tr>
<td>25.0 - 29.9</td>
<td>Overwt High</td>
</tr>
<tr>
<td>30.0 - 34.9</td>
<td>Obese Very High</td>
</tr>
<tr>
<td>35.0 - 39.9</td>
<td>Obese Very High</td>
</tr>
<tr>
<td>≥40</td>
<td>Extremely Obese Extremely High</td>
</tr>
</tbody>
</table>

Diabetes Nutrition Assessment Matrix

<table>
<thead>
<tr>
<th>Food, Nutrition and Exercise History</th>
<th>Biochemical Data, Medical Tests, Procedures</th>
<th>Anthropometric Measurements</th>
<th>Physical Exam Findings</th>
<th>Client History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food with focus on carb, nutrient intake, nutrition related knowledge, practices, physical activity, food availability</td>
<td>Lab data (electrolytes, BGL, BPs, lipids), tests (gastric emptying time, resting metabolic rate)</td>
<td>Ht, wt, BMI, growth rate, and rate of wt change</td>
<td>Oral health, physical appearance, muscle and subcutaneous fat, wasting, and mental status</td>
<td>Meds, use of supplements, medical and health history, social personal and family history</td>
</tr>
</tbody>
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Obese Asian Americans cutpoints for prediabetes and type 2 diabetes:

BMI ≥23 kg/m²

How To Measure Waist Circumference

With arms straight down, measure at elbow joint.

Also Include Waist-to-Hip Ratio

| Waist and Waist to Hip Ratio Chart: Risk of CVD and Obesity-Related Diseases |
|-------------------------------|-------------------------------|-----------------------------|
| MALE | FEMALE | Health Risk Based Solely on Waist and WHR |
| Waist: >40" | Waist: >35" | At Risk |
| WHR: 0.95 or below | WHR: 0.80 or below | Low Risk |
| WHR: 0.96 to 1.0 | WHR: 0.81 to 0.85 | Moderate Risk |
| WHR: 1.0+ | WHR: 0.85+ | High Risk |
Evidence-Based Interventions to Improve BG, Lipids, BP and Reduce Cardiometabolic Risk (CMR) in Adult Patients with Type 1, Type 2 Diabetes are Summarized in:

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

M.E.A.L. P.L.A.N.

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

D = Divide daily calories into ≥3 moderate meals or ≥4 smaller meals (BG)

Let’s Examine Interventions in a Nutshell

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 PWDs 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 be purchased in OTC capsules

After 2 year loan to United States, Michelangelo’s David being returned to Italy

A = Assess relative importance of weight management for overweight and obese PWDs

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

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

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 weight maintenance

• Seen in bariatric surgery: BG improves quickly before weight loss occurs

  o 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…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:

  • Prevent weight gain

  • Combine meds (also insulin) with MNT

  • Seek BG control over weight control
Assuring 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 pt’s personal preferences, lifestyle, goals, etc.

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

Base macronutrient distribution on individualized assessment of current eating patterns, preferences, and metabolic goals

- 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**

<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>1</td>
<td>3</td>
</tr>
<tr>
<td>Blackberries (1/2 c)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Nectarine</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Citrus fruit</td>
<td>1</td>
<td>2–3</td>
</tr>
<tr>
<td>(orange, grapefruit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peach</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Pears</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Plums</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Prunes</td>
<td>1.5</td>
<td>4</td>
</tr>
</tbody>
</table>

<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>
**E** = Ensure that PWDs on insulin-carb ratios subtract 50% of Dietary Fiber that is ≥5 g on label from Total Carbohydrate when estimating amount of carb to be eaten at meals

Ensure same is done with sugar alcohol on 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 g To Be Eaten at Meals

For PWDs on Insulin-Carb Ratio:
- **When Sugar Alcohol** is ≥5 g on label, subtract 50% of Sugar Alcohol g from Total Carbohydrate when estimating Amount of Carb g To Be Eaten at Meals

**T** = Trim mg of sodium/day for BP control to:
- ≤2300
- 1500 – 2400
  - For PWDs + HTN, further reduction to be individualized
  - ≤2400
    - 1500 desirable as associated with lower BP
    - If desired Na level cannot be achieved, ≤1000

BP Goal for PWDs and HTN Treatment

<table>
<thead>
<tr>
<th>BP</th>
<th>Lifestyle Therapy (LT) *</th>
<th>HTN Meds, ACE Inhibitor or ARBs</th>
<th>Thiazide or Loop Diuretic</th>
</tr>
</thead>
<tbody>
<tr>
<td>“LT advised when BP &gt;140/90</td>
<td>DASH Diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal: S: &lt;140, D: &lt;90</td>
<td>↓ Na to ≤2300 mg/day</td>
<td>Weight Loss if needed</td>
<td>Physical Activity</td>
</tr>
<tr>
<td></td>
<td>Moderate Alcohol</td>
<td>↑ Potassium</td>
<td></td>
</tr>
</tbody>
</table>

*IF Not at Goal*
- Continue Lifestyle Therapy

ADD HTN Med(s): If >1 med, 1 to be ACE or ARB (if # not tolerated, other to be used)

**E** = Ensure carbohydrate amount per meal & snack individualized to meet BG targets

- Carb foods, beverages and endogenous insulin are greatest determinant of post-meal BG

- Choose nutrient-dense, high-fiber carbs instead of processed foods with added sodium, fat, and sugars

- Nutrient-dense foods and beverages (e.g., milk) provide vitamins, minerals and other healthful substances with less calories

- Monitoring carb intake via carb counting or experience-based estimation is key BG control strategy
**S** = Shrink saturated fat to <5-6% of cal/day and replace with MUFA (CMR, Lipids, BG)

- ↓ insulin resistance in pre-diabetes and T2 diabetes pts

**S** = Shrink saturated fat to <7% of cal/day

**S** = Shrink trans fat to <1% of cal/day

**S** = Shrink % of calories from trans fat

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

- Shrink saturated fat to 10% of calories

- Shrink dietary cholesterol to 300 mg/day

- Shrink trans fat as much as possible

**S** = Shrink LDL-C and BP with further interventions:

- Consume dietary pattern that emphasizes intake of fruits, veggies, whole grains

- Include low fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, nuts

- Limit intake of sugar-sweetened beverages, red meat

- Adapt this pattern to calorie requirements, culture and personal food preferences and MNT for other dx’s

- Achieve this pattern by following:
  - DASH Diet
  - AHA Diet
  - USDA Food Pattern (see next slide)

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

**S** = Shrink high sucrose foods to avoid displacing nutrient-rich foods (BG)

**M** = Make alcohol intake moderate:

- ≤1 drink/day for women

- ≤2 for men (BP, BG, Wt)

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

**USDA Food Pattern**

[http://www.cnpp.usda.gov/sites/default/files/usda_food_patterns/USDAFoodPatternsSummaryTable.pdf](http://www.cnpp.usda.gov/sites/default/files/usda_food_patterns/USDAFoodPatternsSummaryTable.pdf)
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)
- Oxidation reactions \( \Rightarrow \) free radicals \( \Rightarrow \) oxidative stress (esp. CV system) \( \Rightarrow \) cell damage \( \Rightarrow \) pre-mature aging
- High BG \( \Rightarrow \) glucose toxicity \( \Rightarrow \) glucose oxidation \( \Rightarrow \) free radicals \( \Rightarrow \) 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 supplemental anti-oxidant vitamins E, C and/or \( \beta \)-carotene for prevention and treatment of CVD
- Research indicates high doses of these antioxidants (above Recommended Dietary Allowance) do not provide CV benefit and may cause harm and even shorten life span.

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 = Evaluate carefully the mixed recommendations on omega 3 supplementation:
- 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 unclear whether benefits from habitual fish consumption can be fully reproduced with ROSs
- But: ROSs can help ↓ TG + improve BP and heart rate levels

<table>
<thead>
<tr>
<th>Patients without documented CHD</th>
<th>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).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with documented CHD</td>
<td>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.</td>
</tr>
<tr>
<td>Patients who need to ↓ triglycerides</td>
<td>2 - 4 g of EPA + DHA/day provided as capsules under physician’s care.</td>
</tr>
</tbody>
</table>
A = Assure consistent timing and even spacing of meals and carbohydrate intake

A = Assure priority given to coordinating food with type of diabetes medicine
- If on insulin secretagogues, eat moderate amounts of carb at meals and snacks

L = Learn that fructose consumed as “free fructose” (i.e., naturally occurring in foods such as fruit) may result in better glycemic control compared with isocaloric intake of sucrose or starch and free fructose is 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 calories, if no renal impairment
- T2 DM: amount has no significant effect on BG
- T1 DM: effect on BG is less clear
- Does NOT significantly slow absorption of carb food
- Adding protein NOT shown to treat or prevent low BG

P = Provide protein that meets individual needs; evidence inconclusive to recommend ideal amount 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 amount total fat be individualized for PWDs, as evidence inconclusive for ideal amount of

A = Allow non-nutritive sweeteners as can ↓ calorie and carbohydrate intake if substituted for caloric sweeteners

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 pts that it is not necessary to subtract any of dietary fiber or any of sugar alcohols from total carbohydrate when carb counting at meals and snacks.
- Sugar alcohols (2 calories/g) are:
  - Sorbitol
  - Xylitol
  - Mannitol
  - Isomalt
  - Maltitol
  - Lactitol
  - Hydrogenated starch hydrolysates

Fair, Conditional
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!

 BOTTOM LINE: LIFESTYLE AFFECTS DIABETES!

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

~Author Unknown

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