Evidence-based Cardiovascular Disease Prevention for the Young Adult

Diet, Exercise and Supplementation

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Columbia University
Presentation Rational

• Cardiovascular disease (CVD)
  – Leading cause of morbidity and mortality
  – US & worldwide

• CVD prevention
  – Healthy lifestyle is important
    • Extensive amount of evidence exists
  – Achievable by modifying risk factors such as BP and lipids
    • Particular dietary patterns
    • Nutrient intake
    • Levels and types of physical activity
CVD and the Adolescents and Young Adults

- Early signs of atherosclerotic disease in high numbers
  - *PDAY autopsy study* of adolescents 15-19 years
    - All had aortic and approximately 50% had coronary atherosclerosis
    - ↑ number of risk factors (high lipids, smoking, HTN, DM) = ↑ prevalence
  - CV Health in children
    - *Predicts subsequent cardio-metabolic health in adulthood*
    - *Important to maintain healthy lifestyle behaviors early in life*

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*Preventing Heart Disease in the 21st Century: Implications of the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Study*  
Circulation, 2008 March
Presentation Rational

• Promoting prevention strategies
  – Clinicians play a major role
  – Choosing best advice is difficult
    • Plethora of information available

• Aim of this presentation
  – Review prevention strategies
  – Best evidence for beneficial outcomes
Presentation Outline

• Clinical Case

• I. Cardiovascular Disease and Risk Epidemiology
  – Scope of the problem
  – US population achieving current recommended goals
    • Diet and physical activity

• II. AHA/ACC 2013 Guidelines on Lifestyle Management
  – Dietary Patterns
  – Sodium Intake
  – Physical Activity

• III. Supplementation and CVD Risk Reduction

• IV. Latest Updates: 2013-2014
Clinical Case

• History
  – General
    • 20yo Male in good general health
  – Chief Complaint:
    • Clearance physical for volunteer work
    • Questions about preventive lifestyle
  – Medications: None
  – Supplements:
    • Fish oil 1,000mg 3x/day
    • Vitamin D 1,000mg daily
    • Vitamin E 400 IU daily
    • GNC protein supplement

• Social History
  • 3rd yr. pre-med
  • No tobacco use
  • Drinks 5 ETOH beverages a week
  • No substance use
  • Sexually active with women
  • Works out regularly

• Family History:
  • Father: MI age 49
Clinical Case

• Physical Examination:
  – Vitals:
    • BP 135/85, P 60, R 12, T 98.7
    • Height 5’ 10”, Weight 180 pounds, BMI 25.8
  – Normal physical examination

• Questions about Cardiovascular Disease Prevention
  – Concerned about father’s MI
    • Would like to prevent this from happening to him
  – Trainer/friend advised
    • Paleo diet
    • Use coconut oil instead of other vegetable oils
II. AHA/ACC 2013

Guidelines on Lifestyle Management to Reduce Cardiovascular Risk
2013 AHA/ACC Guidelines on Lifestyle Management to Reduce Cardiovascular Risk

- NHLBI initiated collaboration with AHA and ACC
- Review of current literature and guidelines (through 2011)
  - Particular dietary patterns, nutrient intake, and physical activity
    - Major role in CVD prevention and treatment
    - Through effects on modifiable CVD risk factors
      - Such as BP and lipids

2013 November
AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk: A Report of the American College of Cardiology
American Heart Association Task Force on Practice Guidelines
Circulation
These Prevention Guidelines differ from other ACC/AHA Guidelines

- Not an extensive collection of clinical information
- Scope and focus limited to critical questions in each topic
- Based on highest quality evidence available
  - Recommendations were derived from RTC’s, meta-analyses and observational studies evaluated for quality
  - Recommendations were not formulated when sufficient evidence was not available
2013 AHA/ACC Guidelines on Lifestyle Management to Reduce Cardiovascular Risk

• **Work Group formulated 3 critical questions (CQ)**
  – Greatest impact and relevance to the target audience, PCP
  – Body of report organized by CQ’s

• **Evidence statements**
  – Rating for strength of recommendations
  – Rating for strength of evidence

• **Results of the work group systematic review**
  – 10 dietary recommendations
  – 2 physical activity recommendations
Strength of Recommendation
NHLBI Grades

• **Grade A (Strong Recommendation)**
  – High certainty; net benefit substantial

• **Grade B (Mod Recommendation)**
  – Moderate certainty; net benefit moderate-substantial
  – High certainty; net benefit moderate

• **Grade C (Weak Recommendation)**
  – Moderate certainty; net benefit small

• **Grade D (Recommendation against)**
  – Moderate certainty; no net benefit or risks/harms outweigh benefits

• **Grade E (Expert opinion)**
  – Insufficient, unclear or conflicting evidence but Work Group recommends

• **Grade N (No recommendation)**
  – Not for or against
  – Insufficient, unclear or conflicting evidence
Strength of Evidence

Quality Rating

• **High**
  – Well designed, well executed RCT
  – Represents population results
  – Meta-analysis of such studies
  – High certainty about estimate of effect
  – Further research unlikely to change estimate of effect

• **Moderate**
  – RCT’s with minor limitations affecting confidence
  – Well designed, executed non-RTC or observational studies
  – Meta-analysis of such studies
  – Moderately certain about estimate of effect
  – Further research may have impact

• **Low**
  – RCT’s with major limitations affecting confidence
  – Non RCT’s or observational studies with major limitations
  – Uncontrolled clinical observations without appropriate comparison group (e.g. case series or case reports)
  – Physiological studies in humans
3 Critical Questions

- What is the effect of the following on CVD risk factors:
  - Among adults age ≥ 18 and < 80
  - Compared to no treatment or to other types of interventions

  CQ#1. Dietary patterns and macronutrient composition?

  CQ#2. Dietary intake of sodium and potassium?

  CQ#3. Physical activity?
Critical Question #1
Dietary Patterns and Macronutrients on BP and Lipids?

Mediterranean Dietary Pattern
DASH Dietary Pattern
Dietary Fat and Cholesterol Pattern
Critical Question #1
Dietary Patterns and Macronutrients on BP and Lipids?

• Rational
  – Nutrition plays a major role in modifying CVD risks
  – Dietary patterns rather than specific dietary components
  – Observational studies:
    • *Associations between intake and risk factors*
  – Intervention studies:
    • *Based on expert evidence and then evaluated in RCT’s (MED, DASH Diets)*
  – Lipid and BP were outcomes of focus
    • *CVD morbidity and mortality outcomes were not endpoints*
Mediterranean Dietary Pattern

- **High in:**
  - Vegetables (root and green varieties)
  - Fruits (particularly fresh)
  - Low-fat dairy products, poultry, fish
  - Whole grains-cereals, breads, pasta
  - Nuts (walnuts, almonds, hazelnuts)

- **Low in:**
  - Red meats (lean meats)

- **Use of healthier fats**
  - Olive or canola oil
    - *instead of butter or tropical oils such as palm*
  - Margarines blend with rapeseed or flaxseed oils
Mediterranean Dietary Pattern

• **High in:**
  – Polyunsaturated fatty acid
    • Particularly high in omega 3s
  – Fiber
    • 27-37 grams a day

• **Moderate in:**
  – Total fat
    • 32-35% of total calories

• **Low in:**
  – Saturated fat
    • 9-10% of calories
CQ 1. Mediterranean Pattern Diet on BP and Lipids?

- VS. minimal advice on low-fat diet

- Evidence For BP and Lipid Effect:
  - Strength of evidence: Low

<table>
<thead>
<tr>
<th>Mediterranean</th>
<th>BP</th>
<th>Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy, young</td>
<td>↓ 2-3/1-2 mmHg</td>
<td>No consistent effect LDL-C, HDL-C, TGL</td>
</tr>
<tr>
<td>Middle-aged, older</td>
<td>↓ 6-7/2-3 mmHg</td>
<td>No consistent effect LDL-C, HDL-C, TGL</td>
</tr>
<tr>
<td>3 RF or DM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DASH Dietary Pattern

• High in:
  – Vegetables, fruits
  – Whole grains, nuts
  – Poultry, fish

• Low in:
  – Sweets
  – Sugar-sweetened beverages
  – Red meats
DASH Dietary Pattern

- **High in:**
  - Potassium, Magnesium, Calcium
  - Protein
  - Fiber
- **Low in:**
  - Saturated fat
  - Total fat
  - Total cholesterol
**DASH Dietary Pattern**

**CQ 1. DASH Pattern Diet on BP and Lipids?**
- VS. typical American diet of the 1990’s

- **Evidence For BP and Lipid Effect:**
  - Similar in sub-populations
    - *Adults, AA and Non-AA, older, younger, male, female, w/wo HTN*
  - Strength of Evidence: High

<table>
<thead>
<tr>
<th>Dash</th>
<th>BP</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>TGL</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>↓ 5-6/3 mmHg</td>
<td>↓ 11 mg/dL</td>
<td>↓ 4 mg/dL</td>
<td>↔</td>
</tr>
</tbody>
</table>
CQ 1. DASH Pattern Diet on BP and Lipids?

- DASH Pattern Variations
- Carbohydrate (10% calories) replaced with Protein or Unsaturated fat
  - For example: 2,000 calories/day
  - 50g Carbohydrates → 50g Protein or 22g Unsaturated fat

- Evidence For BP Effect:
  - Strength of evidence: Moderate

<table>
<thead>
<tr>
<th>DASH + Carbohydrate → Protein or Unsaturated Fat</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults with BP of 120-159/80-95</td>
<td>↓ 1 mmHg</td>
</tr>
<tr>
<td>Adults with BP of 140-159/90-95</td>
<td>↓ 3 mmHg</td>
</tr>
</tbody>
</table>
CQ 1. DASH Pattern Diet on BP and Lipids?

- DASH Pattern Variations
- Carbohydrate (10% calories) replaced with Protein or Unsaturated fat
  - For example: 2,000 calories/day
  - 50g Carbohydrates → 50g Protein or 22g Unsaturated fat

- Evidence For Lipid Effect:
  - Strength of Evidence: Moderate

<table>
<thead>
<tr>
<th>DASH + Carbohydrate</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>Triglyceride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>↓ 3 mg/dL</td>
<td>↓ 1 mg/dL</td>
<td>↓ 16 mg/dL</td>
</tr>
<tr>
<td>Unsaturated Fat</td>
<td>↔ mg/dL</td>
<td>↑ 1 mg/dL</td>
<td>↓ 10 mg/dL</td>
</tr>
</tbody>
</table>
CQ 1. DASH Pattern Diet on BP and Lipids?

- DASH Pattern Variations
- For High glycemic diets vs. Low-glycemic diets

• Evidence For BP and Lipids:
  - Strength of Evidence: Insufficient

<table>
<thead>
<tr>
<th>DASH + High vs. Low Glycemic</th>
<th>BP and Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults without DM</td>
<td>Insufficient evidence to establish relationship</td>
</tr>
<tr>
<td>Adults with DM</td>
<td>Not reviewed</td>
</tr>
</tbody>
</table>
## Dietary Fat and Cholesterol Pattern

### Fat Sources

<table>
<thead>
<tr>
<th>Fats</th>
<th>Cholesterol &amp; Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated Fatty Acid (SFA)</td>
<td>Total Cholesterol</td>
</tr>
<tr>
<td>Trans-Fatty Acid (TFA)</td>
<td>LDL-C</td>
</tr>
<tr>
<td>Mono-Unsaturated Fatty Acid (MUFA)</td>
<td>HDL-C</td>
</tr>
<tr>
<td>Poly-Unsaturated Fatty Acid (PUFA)</td>
<td>TGL</td>
</tr>
<tr>
<td>Omega-3 Fatty Acid</td>
<td></td>
</tr>
<tr>
<td>Omega-6 Fatty acid</td>
<td></td>
</tr>
</tbody>
</table>
## Dietary Fat and Cholesterol Pattern

### Fat Sources

<table>
<thead>
<tr>
<th>Saturated Fat (SFA)</th>
<th>Trans Fat Sources (TFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal sources:</td>
<td>“Partially hydrogenated oils”</td>
</tr>
<tr>
<td>Meat and dairy products</td>
<td>Fried</td>
</tr>
<tr>
<td>Plant sources:</td>
<td>Baked goods</td>
</tr>
<tr>
<td>Palm oil</td>
<td>Processed foods</td>
</tr>
<tr>
<td>Coconut oil</td>
<td>Small amount (meats, dairy)</td>
</tr>
</tbody>
</table>


## Dietary Fat and Cholesterol Pattern

### Fat Sources

<table>
<thead>
<tr>
<th>Mono-Unsaturated Fat (MUFA)</th>
<th>Polyunsaturated Fat (PUFA) Omega-6</th>
<th>Polyunsaturated Fat (PUFA) Omega-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oleic acid (Ω-9)</td>
<td>Linoleic acid</td>
<td>α-Linolenic acid (ALA)</td>
</tr>
<tr>
<td>Palmitoleic acid (Ω-7)</td>
<td>Arachidonic acid</td>
<td>Eicosapentaenoic acid (EPA)</td>
</tr>
<tr>
<td>Cis-vaccenic acid (Ω-7)</td>
<td></td>
<td>Docosahexaenoic acid (DHA)</td>
</tr>
</tbody>
</table>
# Dietary Fat and Cholesterol Pattern

## Fat Sources

<table>
<thead>
<tr>
<th>Mono-Unsaturated Fat (MUFA)</th>
<th>Polyunsaturated Fat (PUFA) Omega-6</th>
<th>Polyunsaturated Fat (PUFA) Omega-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avocado</td>
<td>Plant oils:</td>
<td>Fish:</td>
</tr>
<tr>
<td>Nuts:</td>
<td>Corn oil</td>
<td>Herring</td>
</tr>
<tr>
<td>Almonds</td>
<td>Cotton seed</td>
<td>Sardines</td>
</tr>
<tr>
<td>Pecans</td>
<td>Soybean oil</td>
<td>Mackerel</td>
</tr>
<tr>
<td>Plant oils:</td>
<td>Peanut</td>
<td>Salmon</td>
</tr>
<tr>
<td>Canola oil</td>
<td></td>
<td>Nuts:</td>
</tr>
<tr>
<td>Olive oil</td>
<td></td>
<td>Walnuts</td>
</tr>
<tr>
<td>Safflower oil</td>
<td></td>
<td>Plant oils:</td>
</tr>
<tr>
<td>Sunflower oil</td>
<td></td>
<td>Flaxseed</td>
</tr>
<tr>
<td>Peanut oil</td>
<td></td>
<td>Canola oil</td>
</tr>
</tbody>
</table>
# Dietary Fat and Cholesterol Pattern

- **Plant Oils Per 1 Tablespoon (Total fat: 13-14gms)**

<table>
<thead>
<tr>
<th>Oil</th>
<th>Saturated</th>
<th>MUFA</th>
<th>PUFA</th>
<th>6-Ω/3-Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>1.0g</td>
<td>8.9g†</td>
<td>3.9g</td>
<td>2:1 ✓</td>
</tr>
<tr>
<td>Coconut</td>
<td>11.8g†</td>
<td>0.8g</td>
<td>0.2g</td>
<td>*</td>
</tr>
<tr>
<td>Corn</td>
<td>1.8g</td>
<td>3.8g</td>
<td>7.4g†</td>
<td>*</td>
</tr>
<tr>
<td>Cottonseed</td>
<td>3.5g</td>
<td>2.4g</td>
<td>7.1g†</td>
<td>*</td>
</tr>
<tr>
<td>Flaxseed</td>
<td>1.2g</td>
<td>2.5g</td>
<td>9.2g†</td>
<td>1:3 ✓</td>
</tr>
<tr>
<td>Olive</td>
<td>1.9g</td>
<td>9.9g†</td>
<td>1.4g</td>
<td>3-13:1 ↔</td>
</tr>
<tr>
<td>Peanut</td>
<td>2.3g</td>
<td>6.2g</td>
<td>4.3g</td>
<td>*</td>
</tr>
<tr>
<td>Safflower</td>
<td>1.0g</td>
<td>10.2g†</td>
<td>1.7g</td>
<td>*</td>
</tr>
<tr>
<td>Soybean</td>
<td>2.1g</td>
<td>3.1g</td>
<td>7.9g†</td>
<td>7:1 ↔</td>
</tr>
<tr>
<td>Sunflower</td>
<td>1.2g</td>
<td>7.8g†</td>
<td>3.9g</td>
<td>*</td>
</tr>
</tbody>
</table>

*No or minimal 3-Ω

**Note:** USDA
### Dietary Fat and Cholesterol Pattern

- **Nuts Per 1 oz (Total fat calories: 170-200 calories)**

<table>
<thead>
<tr>
<th>Nuts</th>
<th>Saturated</th>
<th>MUFA</th>
<th>PUFA</th>
<th>6-Ω/3-Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almond</td>
<td>1.1g</td>
<td>8.9g</td>
<td>3.5g</td>
<td>27:1</td>
</tr>
<tr>
<td>Hazel nut</td>
<td>1.3g</td>
<td>13.2</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Cashews</td>
<td>2.6g ↑</td>
<td>7.7g</td>
<td>2.2g</td>
<td></td>
</tr>
<tr>
<td>Macadamia</td>
<td>3.4g ↑</td>
<td>16.8</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Pecans</td>
<td>1.8g</td>
<td>11.6g</td>
<td>6.2g</td>
<td>22:1</td>
</tr>
<tr>
<td>Pistachios</td>
<td>1.6g</td>
<td>6.7g</td>
<td>3.8g</td>
<td></td>
</tr>
<tr>
<td>Walnut</td>
<td>1.7g</td>
<td>2.5g</td>
<td>13.4g</td>
<td>4-5:1</td>
</tr>
</tbody>
</table>

*No or minimal 3-Ω
# Dietary Fat and Cholesterol Pattern

<table>
<thead>
<tr>
<th>Per Serving</th>
<th>Walnut</th>
<th>Avocado</th>
<th>Salmon</th>
<th>Rib-eye lean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>185 calories (1oz)</td>
<td>59 calories (1oz)</td>
<td>177 calories (3oz)</td>
<td>233 calories (3oz)</td>
</tr>
<tr>
<td>Total fat</td>
<td>18.0g 162 calories</td>
<td>5.4g 49 calories</td>
<td>11.4g 103 calories</td>
<td>18.8g 168 calories</td>
</tr>
<tr>
<td>SFA</td>
<td>1.7g 9%</td>
<td>0.8g 15%</td>
<td>2.6g 23%</td>
<td>7.7g 41%↑↑</td>
</tr>
<tr>
<td>MUFA</td>
<td>2.5g 14%</td>
<td>3.5g 65%↑↑</td>
<td>3.2g 28%↑</td>
<td>8.2g 44%↑↑</td>
</tr>
<tr>
<td>PUFA 6-Ω/3-Ω</td>
<td>13g 4-5:1 72%↑↑√</td>
<td>0.6g 11%</td>
<td>3.3g 29%↑√</td>
<td>0.7g 4%</td>
</tr>
</tbody>
</table>

**USDA**
Dietary Fat and Cholesterol Pattern

• US Daily Calories and Fat Intake:

  – Total Calories/day
    • Total fat intake: 33%
    • Saturated fat intake: 11%

  Men
    2,500 calories
    92g/day
    31g/day

  Women
    1,800 calories
    66g/day
    22g/day
Dietary Fat and Cholesterol Pattern

CQ 1. Dietary Fat Diet on Lipids?
- Lowered SFA and Total Fat
- Pattern
  - Control Diet vs. Study Diet
  - Saturated Fatty Acid: 14%-15% vs. 5%-6%
  - Total fat: 34%-38% vs. 26-27%
  - Protein: 13%-15% vs. 15-18%
  - Carbohydrate: 48-51% vs. 55-59%

Evidence For Lipid Effect:
- Strength of Evidence: High

<table>
<thead>
<tr>
<th>Control Diet</th>
<th>LDL-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Diet (Lower SFA &amp; TF)</td>
<td>↓ 11-13 mg/dL</td>
</tr>
</tbody>
</table>

E.g. 2,000 calories/day
- 33g → 13g
- 84g → 64g
- 33g → 40g
- 255g → 295g
CQ 1. Dietary Fat Diet on Lipids?

- SFA (1% calories) replaced by Carbohydrates, MUFA or PUFA (1% calories):
  - For example: 2,000 calories/day
  - 2.2g SFA → 5g Carbohydrates, 2.2g MUFA or 2.2g PUFA

- Evidence For Lipid Effect:
  - Strength of Evidence: Moderate

<table>
<thead>
<tr>
<th>SFA</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>Triglyceride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>↓ 1.2 mg/dL</td>
<td>↓ 0.4 mg/dL</td>
<td>↑ 1.9 mg/dL</td>
</tr>
<tr>
<td>MUFA</td>
<td>↓ 1.3 mg/dL</td>
<td>↓ 1.2 mg/dL</td>
<td>↑ 0.2 mg/dL</td>
</tr>
<tr>
<td>PUFA</td>
<td>↓ 1.8 mg/dL</td>
<td>↓ 0.2 mg/dL</td>
<td>↓ 0.4 mg/dL</td>
</tr>
</tbody>
</table>
**Dietary Fat and Cholesterol Pattern**

**CQ 1. Dietary Fat Diet on Lipids?**
- Carbohydrates (1% calories) replaced by MUFA or PUFA (1% calories)
  - *For example: 2,000 calories/day*
  - *5g Carbohydrates → 2.2g MUFA or 2.2g PUFA*

**Evidence For Lipids Effect:**
- Strength of Evidence: Moderate

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>Triglyceride</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUFA</td>
<td>↓ 0.3 mg/dL</td>
<td>↑ 0.3 mg/dL</td>
<td>↓ 1.7 mg/dL</td>
</tr>
<tr>
<td>PUFA</td>
<td>↓ 0.7 mg/dL</td>
<td>↑ 0.2 mg/dL</td>
<td>↓ 2.3 mg/dL</td>
</tr>
</tbody>
</table>
Dietary Fat and Cholesterol Pattern

CQ 1. Dietary Fat Diet on Lipids?

- TFA (1% calories) replaced by MUFA, PUFA, SFA or Carb (1% calories)
  - For example: 2,000 calories/day
  - 2.2g TFA → 2.2g MUFA, 2.2g PUFA, 2.2g SFA or 5g Carbohydrates

- Evidence For Lipids Effect:
  - Strength of Evidence: Moderate

<table>
<thead>
<tr>
<th>TFA</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>Triglyceride</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUFA</td>
<td>↓ 1.5 mg/dL</td>
<td>↑ 0.4 mg/dL</td>
<td>↓ 1.2 mg/dL</td>
</tr>
<tr>
<td>PUFA</td>
<td>↓ 2.0 mg/dL</td>
<td>↑ 0.5 mg/dL</td>
<td>↓ 1.3 mg/dL</td>
</tr>
<tr>
<td>SFA</td>
<td></td>
<td>↑ 0.5 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>↓ 1.5 mg/dL</td>
<td>↔</td>
<td>↔</td>
</tr>
</tbody>
</table>
**Dietary Fat and Cholesterol Pattern**

**CQ 1. Dietary Cholesterol Diet on Lipids?**
- Dietary cholesterol reduction

**Evidence For Lipid Effect:**
- Strength of Evidence: Insufficient

<table>
<thead>
<tr>
<th>Cholesterol</th>
<th>Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowering dietary cholesterol</td>
<td>Insufficient evidence: for LDL-C reduction</td>
</tr>
</tbody>
</table>
Critical Question #1
Dietary Patterns and Macronutrients on BP and Lipids?

• Recommendations
  – Advise adults who would benefit from LDL–C or BP lowering to:
    • Emphasize intake of vegetables, fruits, whole grains
    • Include low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, nuts
    • Limit intake of sweets, sugar-sweetened beverages, red meats
    • Adapt to appropriate calorie requirements, personal and cultural food preferences, and nutrition therapy for other medical conditions (e.g. DM).
    • Achieve this pattern by following plans such as DASH dietary pattern, the USDA Food Pattern, or AHA Diet.
  – Grade of recommendation: Strong
Critical Question #1
Dietary Patterns and Macronutrients on BP and Lipids?

- Recommendations
  - Advise adults who would benefit from **LDL-C lowering** to:
    - *Reduce % of calories for SFA*
      - Aim for 5-6% of calories from SFA
      - Current US intake: 11%
    - *Reduce % of calories from TFA*
    - *Favorable effect on lipids with replacement by PUFA, MUFA, then Carb (whole grain preferred over refined)*
  - Grade of recommendation: Strong
Critical Question #2
Dietary Sodium & Potassium Intake on BP and CVD Outcomes?
Critical Question #2
Dietary Sodium & Potassium Intake on BP and CVD Outcomes?

• **Rational:**
  – Minerals sodium and potassium
    • *Associated with CVD risk factors and outcomes*
  – Other minerals, e.g., calcium, magnesium
    • *Not reviewed*
    • *Consumption is limited to few foods or food groups*
    • *Recommendation unlikely to increase or decrease consumption of mineral (rather than the food)*
Sodium Intake

• US Daily Sodium Intake:
  – 3,400-3,500mg/day

• Top Sources:
  – Bread and rolls (7.4%)
  – Cold cuts & cured meats (5.1%)
  – Pizza (4.9%)
  – Soups (4.3%)
Sodium Intake

- **US Daily Sodium Intake:**
  - 3,400-3,500mg/day

Table salt
(1 teaspoon = 6g)
2,325mg

<table>
<thead>
<tr>
<th>Food</th>
<th>Sodium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread (#1 slice)</td>
<td>328mg</td>
</tr>
<tr>
<td>Plain hotdog (#1 piece)</td>
<td>567mg</td>
</tr>
<tr>
<td>Cheese pizza (#1 slice)</td>
<td>640mg</td>
</tr>
<tr>
<td>Chicken noodle soup (#1 cup)</td>
<td>343mg</td>
</tr>
</tbody>
</table>

**USDA Medical Services**
Sodium Intake

CQ2: Sodium Intake on BP?
   – Reducing Sodium intake

• Evidence For BP Effect:
   – Strength of evidence: High

<table>
<thead>
<tr>
<th>Sodium Intake</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing Sodium intake</td>
<td>↓ BP</td>
</tr>
</tbody>
</table>
Sodium Intake

CQ2: Sodium Intake on BP?
- Reducing Sodium intake measured by 24-hour urinary sodium excretion

- Evidence For BP Effect:
  - Strength of evidence: Moderate

<table>
<thead>
<tr>
<th>Sodium Urinary Excretion</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing Sodium urinary excretion 3,300 mg/day → 2,400 mg/day</td>
<td>↓ 2/1 mmHg</td>
</tr>
<tr>
<td>Reducing Sodium urinary excretion 3,300 mg/day → 1,500 mg/day</td>
<td>↓ 7/3 mmHg</td>
</tr>
</tbody>
</table>
Sodium Intake

CQ2: Sodium Intake on BP?

- Counseling to reduce sodium <1,500 mg/day

- Evidence For BP Effect:
  - Strength of evidence: High
  - Similar in sub-populations
    - Adults with pre-HTN or HTN: In Men, Women, AA and Non AA, young and old

<table>
<thead>
<tr>
<th>Sodium intake</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counseling to reduce Sodium intake &lt;1,500 mg/day</td>
<td>↓ 3-4/1-2 mmHg</td>
</tr>
</tbody>
</table>
Sodium + DASH Diet

CQ2: Sodium Intake + DASH Diet on BP?

- Reducing Sodium intake + DASH dietary pattern

**Evidence For BP Effect:**

- Strength of evidence: Moderate

<table>
<thead>
<tr>
<th>Sodium Intake</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing Sodium intake + DASH vs. Reducing Sodium intake alone</td>
<td>More BP lowering</td>
</tr>
</tbody>
</table>
Sodium Intake

CQ2: Sodium Intake on CVD Outcomes?

- Sodium intake and CVD events

- Evidence For CVD Outcomes:
  - Strength of evidence: Low

<table>
<thead>
<tr>
<th>Sodium Intake</th>
<th>CVD Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing Sodium intake by 1,000 mg/day</td>
<td>↓ CVD events 30%</td>
</tr>
<tr>
<td>Higher Sodium intake</td>
<td>Associated with ↑ risk of fatal and non-fatal stroke and CVD</td>
</tr>
</tbody>
</table>
Potassium Intake

CQ2: Potassium Intake on BP and CVD Outcomes?
  - Increasing dietary Potassium intake

• Evidence For BP and CVD Outcome Effect:
  - Strength of evidence: Insufficient (BP)
  - Strength of evidence: Low (CVD outcome)

<table>
<thead>
<tr>
<th>Potassium Intake</th>
<th>BP</th>
<th>CVD Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing Potassium intake</td>
<td>Insufficient evidence: BP reduction</td>
<td>Associated with ↓ stroke risk</td>
</tr>
</tbody>
</table>
Critical Question #2
Dietary Sodium & Potassium Intake on BP and CVD Outcomes?

• Recommendations:
  – Advise adults who would benefit from BP lowering to:
    • Lower sodium intake
    • Consume no more than 2,400 mg/day of sodium
    • Further reduction to 1,500 mg/day is desirable
    • Reduce sodium intake by at least 1,000 mg/day even if the desired daily sodium intake is not achieved
    • Combine DASH dietary pattern with lower sodium intake
  – Recommendation grade: Strong-Moderate
Critical Question #3
Physical Activity on BP and Lipids?
Critical Question #3
Physical Activity on BP and Lipids?

• Rational:
  – Large observational data associate ↑ levels of physical activity with:
    • ↓ CVD and other chronic diseases
    • Prolonged longevity
    • Inverse dose response, curvilinear relationship
  – Elimination of physical inactivity worldwide lead to:
    • Estimated 6% ↓ in CHD
    • 0.68 year ↑ longevity
  – Propose mechanism: effect of exercise on Lipids and BP
    • HTN reduction: 27% ↓ in CVD rates
    • Lipid reduction: 19% ↓ in CVD rates
CQ3: Physical Activity on Lipids?
- Aerobic physical activity vs. Control

- **Evidence For Lipid Effect:**
  - Strength of evidence: Moderate

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>LDL-C</th>
<th>Non-HDL-C</th>
<th>HDL-C</th>
<th>TGL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic physical activity</td>
<td>↓ 3-6 mg/dL</td>
<td>↓ 6 mg/dL</td>
<td>Not consistent</td>
<td>Not consistent</td>
</tr>
</tbody>
</table>
Physical Activity

CQ3: Physical Activity on BP?

– Aerobic exercise training vs. Control
– Adult men and women at all BP levels
– 3-4 sessions/week, 40 minutes/session, moderate to vigorous intensity
– 12 weeks duration

• Evidence for BP Effect:
  – Strength of evidence: High

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic exercise training</td>
<td>↓ 2-5 mmHg</td>
<td>↓ 1-4 mmHg</td>
</tr>
</tbody>
</table>
Physical Activity

CQ3: Physical Activity on BP and Lipids?

– Resistance exercise training vs. Control
– $\geq$3 days/week, 9 exercises performed for 3 sets and 11 repetitions at an average of 70% of 1 maximal repetition
– 24 weeks duration

• Evidence for BP and Lipid Effect:
  – Strength of Evidence Low

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>LDL-C</th>
<th>Non-HDL-C</th>
<th>HDL-C</th>
<th>TGL</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance exercise training</td>
<td>↓ 6-9 mg/dL</td>
<td>↓ 6-9 mg/dL</td>
<td>↔</td>
<td>↓ 6-9 mg/dL</td>
<td>Insufficient evidence</td>
</tr>
</tbody>
</table>
Critical Question #3
Physical Activity on BP and Lipids?

• **Recommendations:**
  – Advise aerobic physical activity for **LDL-C and non-HDL-C and/or BP lowering**:
    • 3-4 sessions/week, 40 minute/sessions, moderate to vigorous intensity
      – 2.5 hrs/wk of moderate intensity, such as brisk walking
      – 1.25 hrs/wk of vigorous intensity
      – 12 METS/week in general
    • *Dose/response relationship*
      – Additional benefits occur with higher intensity, frequency and duration
      – Some is better than none
III. Supplementation & CVD Risk Reduction

Vitamins
Anti-oxidants
Fish oils
Vitamin D
Supplementation and CVD Risk Reduction

• Rational:
  – Many studies examined associations between particular vitamins and CVD
  – Antioxidant vitamin (Vitamins A, C, and E; β-carotene; and folic acid) deficiencies
    • Associated with blood vessel changes that occur in CVD
  – Perhaps taking these vitamins might decrease CVD
  – Studies have varied in quality and their results often conflict
Antioxidant Supplements

Antioxidant Supplements to Lower/Increase All-cause Mortality?

– Review of 78 randomized clinical trials; 1977-2012
– 296,707 participants; mean age: 63 yo
– Antioxidant supplements
  • *Beta carotene, vitamin A, C, E, selenium*
  • *Vs. placebo or no intervention*
– Primary outcome: All-cause mortality

2013 September
*Antioxidant Supplements to Prevent Mortality*
JAMA
## Antioxidant Supplements to Lower/Increase All-cause Mortality?

<table>
<thead>
<tr>
<th>Antioxidant Supplements</th>
<th>All-cause Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antioxidants</td>
<td>NOT associated with lower all-cause mortality</td>
</tr>
<tr>
<td>Beta carotene, vitamin E, and higher doses of vitamin A</td>
<td>Associated with higher all-cause mortality</td>
</tr>
</tbody>
</table>

2013 September

*Antioxidant Supplements to Prevent Mortality*

*JAMA*
Vitamin, Mineral, and MVI Supplements to Prevent CVD and Cancer?

- U.S. Preventive Services Task Force Recommendations
- Healthy adults, typically aged ≥50 years, no special nutritional needs

<table>
<thead>
<tr>
<th>Vitamin Supplements</th>
<th>CV Disease and Cancer Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVI and/or single- or paired-nutrient supplements</td>
<td>Insufficient evidence</td>
</tr>
<tr>
<td>Beta carotene and vitamin E</td>
<td>Recommends against use</td>
</tr>
</tbody>
</table>

2014 February
*Vitamin, Mineral, and Multivitamin Supplements to Prevent CV Disease and Cancer*
*Annals of Intern Medicine*
Fish Oil

Fish Oil to Reduce CV Morbidity and Mortality?

– Large general-practice, double-blind, placebo-controlled clinical trial
– 12,513 participants with multiple CV risk factors
– n–3 fatty acids
  • Eicosapentaenoic acid (EPA) & Docosahexaenoic acid (DHA)
  • Vs. placebo
– Primary endpoint: death, nonfatal MI and nonfatal stroke

2013 May
N-3 Fatty Acids in Patients with Multiple CV Risk Factors
New England Journal of Medicine
Fish Oil

Fish Oil to Reduce CV Morbidity and Mortality?

<table>
<thead>
<tr>
<th>Fish oils</th>
<th>CV Morbidity and Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>N–3 fatty acids</td>
<td>No reduction</td>
</tr>
</tbody>
</table>

2013 May

_N-3 Fatty Acids in Patients with Multiple CV Risk Factors_

New England Journal of Medicine
Vitamin D

Vitamin D and Cardiovascular Disease?

- Low 25-OH D levels associated with hypertension
  - Dietary salt loading results in ↑ BP worse with vitamin D deficiency
  - Inverse relationship between vitamin D metabolites and plasma renin activity
- Vitamin D trials report show no BP changes or small reductions in BP
- Several meta-analyses and systematic reviews have conflicting conclusions

2013 June

Vitamin D and Cardiovascular Disease: Is the Evidence Solid?

European Heart Journal
Vitamin D to Reduce BP?

- Double-blind, placebo-controlled randomized trial
- 159 patient, >70 yo with SBP >140
- 100,000 U oral cholecalciferol vs. placebo every 3 months for 1 year

2013 October

*Cholecalciferol treatment to reduce BP in older patients with isolated systolic hypertension*

*JAMA*
## Vitamin D to Reduce BP?

<table>
<thead>
<tr>
<th>Vitamin D</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Cholecalciferol</td>
<td>No effect</td>
</tr>
</tbody>
</table>

2013 October

**Cholecalciferol treatment to reduce BP in older patients with isolated systolic hypertension**

**JAMA**
Red Yeast Rice to Lower Cholesterol?

- Contains monacolin K
  - Chemical structure as lovastatin (inhibitor of HMG-CoA reductase)
Red Yeast Rice to Lower Cholesterol?

<table>
<thead>
<tr>
<th>Red Yeast Rice</th>
<th>Cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RYR products containing substantial Monacolin K</td>
<td>Lowers TC and LDL-C</td>
</tr>
<tr>
<td>RYR products containing very little Monacolin K</td>
<td>No effect</td>
</tr>
</tbody>
</table>

- Marked Monacolin K variability in commercial RYR products
- Several products contain citrinin (potentially nephrotoxic mycotoxin)
- Case reports of myopathy and rhabdomyolysis
- FDA (1998): RYR product with substantial amount no longer dietary supplement

2013 April

Complementary and Alternative Medicine and CVD: An Evidence-Based Review
Evidence-Based Complementary and Alternative Medicine
## Miscellaneous Supplements and CVD Risk?

<table>
<thead>
<tr>
<th>Supplements</th>
<th>CV Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garlic</td>
<td>No significant difference in LDL-C, HDL-C, TGL, or TC-HDL-C ratio&lt;br&gt;Associated with ↓ BP (10-12/6-9mmHg) in patients with elevated SBP&lt;br&gt;Insufficient evidence: reducing CV morbidity and mortality risk</td>
</tr>
<tr>
<td>Ginseng</td>
<td>No significant effect on BP, lipid profile</td>
</tr>
<tr>
<td>Ginkgo biloba</td>
<td>No BP reduction&lt;br&gt;No total or CVD mortality or events reduction</td>
</tr>
</tbody>
</table>

2013 April<br><br>**Complementary and Alternative Medicine and CVD: An Evidence-Based Review**<br><br>Evidence-Based Complementary and Alternative Medicine
Testosterone Therapy

Testosterone therapy and CVD Outcome among Men?

- Retrospective analysis among male veterans
- 8,709 men with low testosterone levels
  - Started on testosterone therapy
- Primary outcome: Mortality, MI, stroke

2013 November
Association of Testosterone Therapy With Mortality, MI, and Stroke in Men With Low Testosterone Levels
JAMA
## Testosterone Therapy and CVD Outcome among Men?

<table>
<thead>
<tr>
<th>Testosterone Therapy</th>
<th>CVD Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men With or Without CAD</td>
<td>Higher all-cause mortality</td>
</tr>
<tr>
<td></td>
<td>Higher MI</td>
</tr>
<tr>
<td></td>
<td>Higher stroke</td>
</tr>
</tbody>
</table>

2013 November

*Association of Testosterone Therapy With Mortality, MI, and Stroke in Men With Low Testosterone Levels*

*JAMA*
IV.

Latest Updates 2013-2014

Sodium Intake
Fatty Acids
Dietary Patterns & Micronutrients
Latest Updates:
Sodium Intake
Sodium Intake and Risk of CVD?

- Institute of Medicine Committee (IOM) review and assessment
- Sodium intake reduction to 1,500-2,300 mg per day
  - General population (average Sodium intake: 3,400mg/day)
  - Subgroups: hypertension and prehypertension, > 51 yo, AA, DM, CKD, CHF
- Association with risk of heart disease, stroke, or all-cause mortality

2013 May

Sodium Intake in Populations: Assessment of Evidence
IOM, The National Academies Press
Sodium Intake and Risk of CVD?

<table>
<thead>
<tr>
<th>Sodium intake In General Population</th>
<th>CVD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease excessive Sodium intake (e.g. ≤2,300 mg/day)</td>
<td>Evidence supports health outcome benefit</td>
</tr>
<tr>
<td>Sodium intake 1,500-2300 mg/day</td>
<td>Insufficient and inconsistent evidence Additional observational &amp; randomized controlled trials</td>
</tr>
<tr>
<td>Sodium intake &lt;1,500 day</td>
<td>No evidence for benefit</td>
</tr>
</tbody>
</table>

2013 May
Sodium Intake in Populations: Assessment of Evidence
IOM, The National Academies Press
## Sodium Intake and Risk of CVD?

<table>
<thead>
<tr>
<th>Sodium intake In Population Group</th>
<th>CVD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium intake 1,500-2,300mg day in population subgroups</td>
<td>No evidence for benefit Some evidence for risk of adverse health outcomes: DM, CRD, CVD</td>
</tr>
<tr>
<td>Low sodium intake in population subgroups</td>
<td>Higher risk of adverse health effects: Mod-severe CHF patients and receiving aggressive therapeutic regimens</td>
</tr>
</tbody>
</table>
Sodium Intake

Sodium Intake and Risk of CVD?

– 2,275 men and women ages 30-54 years
  • with high normal BP (pre-hypertension)
– Multiple 24-hour urine sodium excretion
– Primary endpoints:
  • CVD including (MI), stroke, CABG, PTCA
  • CVD death

2014 January
TOHP (Trials of Hypertension Prevention) evaluated Supplement and Lifestyle Interventions on BP Circulation
## Sodium Intake and Risk of CVD?

<table>
<thead>
<tr>
<th>Sodium Intake</th>
<th>CVD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>For every 1,000mg/day Sodium excretion</td>
<td>17% linear ↑ in CVD risk</td>
</tr>
<tr>
<td>↓ 3,600mg/day → 2,300mg/day</td>
<td>Linear association ↓ in CV events</td>
</tr>
<tr>
<td>↓ 3,600mg/day → 1,500mg/day</td>
<td>Linear association ↓ in CV events (data were sparse)</td>
</tr>
<tr>
<td>Conclusion: reducing sodium intake to 1500 - 2300mg/day</td>
<td>Consistent with overall health benefits in the majority of the population</td>
</tr>
</tbody>
</table>

2014 January  
*TOHP (Trials of Hypertension Prevention) evaluated Supplement and Lifestyle Interventions on BP*  
*Circulation*
Sodium Intake

- The Institute of Medicine (IOM)
  - Salt restriction is necessary
  - No evidence of safety and efficacy for <2,300 mg/day
- American Heart Association (AHA)
  - <1500 mg/day
- World Health Organization (WHO)
  - <2000 mg/day
- Dietary Guidelines for Americans
  - <2300 mg/day
  - <1500 mg for persons >51 years, AA, DM, HTN, and CKD
Latest Updates:

Fatty Acids
Fatty Acids

Fatty acids (SFA, TFA, PUFA) and Coronary Disease Risk?

- Meta-analysis of over 70 reports, including observational studies and randomized controlled trials
- 512,420 participants
- Fatty acid dietary intake, supplementation, and biomarkers
- Association with coronary disease

2014 March
Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk: A Systematic Review and Meta-analysis
Annals of Internal Medicine
# Fatty Acids

## Fatty acids (SFA, TFA, PUFA) and Coronary Disease Risk?

<table>
<thead>
<tr>
<th>Fats</th>
<th>Coronary Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFA</td>
<td>No association</td>
</tr>
<tr>
<td>TFA</td>
<td>Associated with ↑ risk</td>
</tr>
<tr>
<td>MUFA</td>
<td>No association</td>
</tr>
<tr>
<td>Omega 3 and Omega 6 PUFA</td>
<td>No significant reduction (trend)</td>
</tr>
<tr>
<td>Conclusion:</td>
<td></td>
</tr>
<tr>
<td>Reduced consumption of SFA or High consumption of PUFA</td>
<td>Findings do not clearly support CV guidelines</td>
</tr>
</tbody>
</table>

### 2014 March

*Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk: A Systematic Review and Meta-analysis*  
*Annals of Internal Medicine*
Latest Updates:
Dietary Patterns & Macronutrients

Fruits & Vegetables, Nuts, Flavinoids
Mediterranean Diet, Vegetarian Diet
Added Sugar, Diet drinks
Fruits & Vegetables in Young Adults to Lower Coronary Atherosclerosis?

- Coronary Artery Risk Development in Young Adults (CARDIA) study
- 2648 men and women aged 18 to 30yo
- 20 year diet assessment
- Long-term benefits assessed by coronary artery calcification (CAC)

2014 April

*The Association of Fruit and Vegetable Consumption during Early Adulthood With the Prevalence of Coronary Artery Calcium after 20 years of Follow-up*

Journal of the American College of Cardiology
## Fruits & Vegetables in Young Adults to Lower Coronary Atherosclerosis?

<table>
<thead>
<tr>
<th>Fruits &amp; Vegetables</th>
<th>Coronary Artery Calcification (CAC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women:</td>
<td></td>
</tr>
<tr>
<td>Top third consumers (8.8 servings) vs. Bottom third consumers (3.3 servings)</td>
<td>40% less likely to have coronary plaque</td>
</tr>
<tr>
<td>Men</td>
<td>No relationship</td>
</tr>
<tr>
<td></td>
<td>(may be underpowered for detection)</td>
</tr>
</tbody>
</table>

2014 April  
*The Association of Fruit and Vegetable Consumption during Early Adulthood With the Prevalence of Coronary Artery Calcium after 20 years of Follow-up*  
Journal of the American College of Cardiology
Nuts

Nuts to Lower Total and Specific-Cause Mortality?

– Large observational analysis
– 76,464 women in the Nurses’ Health Study (1980-2010)
– 42,498 men in the Health Professionals Follow-Up Study (1986-2010)

2013 November
Association of Nut Consumption With Total and Cause-Specific Mortality
New England Journal of Medicine
Nuts to Lower Total and Specific-Cause Mortality?

<table>
<thead>
<tr>
<th>Nuts</th>
<th>Total &amp; Specific Cause Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of nut consumption (both peanuts and</td>
<td>Independently and inversely associated with total and</td>
</tr>
<tr>
<td>tree nuts)</td>
<td>cause-specific mortality</td>
</tr>
<tr>
<td>FDA Recommendation: 43 g (1.5 oz.) of nuts per</td>
<td>May have beneficial cardiovascular effects</td>
</tr>
<tr>
<td>day (as part of a low-fat diet)</td>
<td></td>
</tr>
</tbody>
</table>

2013 November

*Association of Nut Consumption With Total and Cause-Specific Mortality*

New England Journal of Medicine
Dietary Flavonoids (Anthocyanins) to Lower MI Risk among Women?

- Data from the Nurses’ Health Study (NHS) II
- 93,600 women, ages 25-42 years, healthy at baseline
- Food intake questionnaire on anthocyanin-rich foods
  - Fruits (e.g. apples, strawberries, and blueberries), vegetables (e.g. onion, eggplant), tea, and wine

2013

*High Anthocyanin Intake Is Associated With a Reduced Risk of MI in Young and Middle-Aged Women*

*Circulation*
**Flavonoids**

**Dietary Flavonoids (Anthocyanins) to Lower MI Risk among Women?**

<table>
<thead>
<tr>
<th>Anthocyanins (Flavonoids)</th>
<th>MI Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthocyanin-rich foods (blueberries and strawberries) &gt;3 servings/week</td>
<td>Decreased: Hazard Ratio 0.66 (Note: Not a randomized trial Anthocyanin group participants have healthier lifestyle = smoke less, exercise more)</td>
</tr>
<tr>
<td>Other flavonoid foods</td>
<td>No effect</td>
</tr>
</tbody>
</table>

**2013**

*High Anthocyanin Intake Is Associated With a Reduced Risk of MI in Young and Middle-Aged Women*

*Circulation*
Vegetarian Dietary Pattern to Lower Mortality?

- Prospective cohort study (Adventist Health Study)
- 96,469 Seventh-day Adventist men and women 2002-2007
- Five dietary patterns:
  - non-vegetarian, semi-vegetarian, pesco-vegetarian, lacto-ovo–vegetarian and vegan
- Association with all-cause and cause-specific mortality

2013 June
Vegetarian Dietary Patterns and Mortality in Adventist Health Study 2
JAMA
## Vegetarian Diet Patterns to Lower Mortality?

<table>
<thead>
<tr>
<th>Dietary patterns</th>
<th>Mortality</th>
</tr>
</thead>
</table>
| Vegetarian diets | Lower all-cause mortality and with some reductions in cause-specific mortality  
Results appeared to be more robust in males |
Vegetarian Diet

Vegetarian Dietary Pattern to Lower Blood Pressure?

- Systematic review and meta-analysis
  - 7 controlled clinical trials (311 participants)
  - 32 observational studies (21,604 participants)
- Mean age 44-46yo
- Association between vegetarian diets and BP

2014 April
Vegetarian Diets and Blood Pressure
JAMA
## Vegetarian Dietary Pattern to Lower Blood Pressure?

<table>
<thead>
<tr>
<th>Dietary patterns</th>
<th>Blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian diets vs. Omnivorous diets</td>
<td>Lower BP (4.8 mmHg/2.2 mmHg) in controlled clinical trials</td>
</tr>
<tr>
<td></td>
<td>Lower BP (6.9 mmHg/4.7 mmHg) in observational studies</td>
</tr>
</tbody>
</table>

2014 April  
*Vegetarian Diets and Blood Pressure*  
*JAMA*
Mediterranean Diet

Mediterranean Diet to Reduce Cardiovascular Event?

– Multicenter randomized trial
– 7,447 participants with high CV risk (HTN, DM, hyperlipidemia)
  • But with no CV disease
– Control diet (advised to reduce dietary fat) vs.
  • Mediterranean diet supplemented with extra-virgin olive oil or
  • Mediterranean diet supplemented with mixed nuts
– Primary end point: major CV events (MI, stroke, or CV death)

2013 May
Primary Prevention of Cardiovascular Disease With a Mediterranean Diet
New England Journal of Medicine
### Mediterranean Diet to Reduce Cardiovascular Event?

<table>
<thead>
<tr>
<th>Dietary Patterns</th>
<th>CV Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediterranean diet with olive oil</td>
<td>↓ Incidence of major CV events (HR 0.70)</td>
</tr>
<tr>
<td>Mediterranean diet with nuts</td>
<td>↓ Incidence of major CV events (HR 0.70)</td>
</tr>
</tbody>
</table>

---

2013 May

*Primary Prevention of Cardiovascular Disease With a Mediterranean Diet*

New England Journal of Medicine
Mediterranean Diet

Mediterranean Diet to Reduce CV Risk Factors?

– Multicenter, randomized, primary prevention trial
– 772 participants with high CVD risk
– Low-fat diet vs.
  • Mediterranean diet with olive oil or
  • Mediterranean diet with tree nuts
– Primary outcomes: glucose levels, BP, lipid profile & CRP at 3 months

2014 February
Effects of a Mediterranean-Style Diet on Cardiovascular Risk Factors: A Randomized Trial
Ann Intern Med
Mediterranean Diet to Reduce CV Risk Factors?

<table>
<thead>
<tr>
<th>Dietary Patterns</th>
<th>Glucose</th>
<th>SBP</th>
<th>TC/HDL-C</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediterranean + Olive oil</td>
<td>-7.02 mg/dl</td>
<td>-5.9 mmHg</td>
<td>-0.38</td>
<td>-0.54 mg/L</td>
</tr>
<tr>
<td>Mediterranean + Tree nuts</td>
<td>-5.4 mg/dl</td>
<td>-7.1 mmHg</td>
<td>-0.26</td>
<td>-0.54 mg/L</td>
</tr>
</tbody>
</table>

2014 February
*Effects of a Mediterranean-Style Diet on Cardiovascular Risk Factors: A Randomized Trial*  
Ann Intern Med
Added Sugar

• **US Daily Added Sugar Consumption:**
  
  – **Men**
    
    • 355 calories/day
    • 22 tsp/day
  
  – **Women**
    
    • 339 calories/day
    • 21 tsp/day
  
  – 155 calories/day from sugar-sweetened beverages
Added Sugar

- US Daily Added Sugar Consumption:
  - 340-355 calories/day
  - 21-22 tsp/day

Granulated sugar
(1 teaspoon = 4.2g)
16 calories

Soda beverage
(#1 can, 12 oz)
39g
8 ½ tsp

Ice cream vanilla
(# ½ cup)
14g
4 tsp

Chocolate bar
(#1 bar, 43g)
24g
6 tsp

Chocolate cake
(#1 piece, 1/8th, 64g)
26g
6 ½ tsp

USDA Granulated sugar
(1 teaspoon = 4.2g)
16 calories
Added Sugar Consumption and CVD mortality?

- National Health and Nutrition Examination Survey (NHANES)
- 31,147 participants, median follow-up period of 14.6 years
- 24-hour dietary recalls of added sugars
  - sugar-sweetened beverages, grain-based desserts, fruit drinks, dairy desserts, candy, RTE cereals, and yeast breads
  - but NOT naturally occurring sugar - fruits & fruit juices
- Primary outcome: CV mortality

April 2014
Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults
JAMA
# Added Sugar Consumption and CVD mortality?

<table>
<thead>
<tr>
<th>Added Sugar (% of calories)</th>
<th>(e.g. 2,000 calories/day) # tsp of Added Sugar</th>
<th>CVD Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.4% of calories</td>
<td>(9 tsp)</td>
<td>HR 1.0</td>
</tr>
<tr>
<td>11.4% of calories</td>
<td>(14 tsp)</td>
<td>HR 1.09</td>
</tr>
<tr>
<td>14.8% of calories</td>
<td>(18 tsp)</td>
<td>HR 1.23</td>
</tr>
<tr>
<td>18.7% of calories</td>
<td>(23 tsp)</td>
<td>HR 1.49</td>
</tr>
<tr>
<td>25.2% of calories</td>
<td>(32 tsp)</td>
<td>HR 2.43</td>
</tr>
</tbody>
</table>

April 2014

*Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults*

*JAMA*
Diet Drinks

Diet Drink Consumption and CV Risks?

– Women’s Health Initiative Observational Study
– 59,614 women, mean age 62.8 yo, no existing CV disease
– 12-oz. diet drink consumption e.g. 2/day (highest) vs. 0-3/month (lowest)
– Primary outcome: CAD, CHF, MI, coronary revascularization, ischemic stroke, PAD, and CVD death
– Adjustment for BMI, smoking, HRT, physical activity, calorie intake, salt intake, DM, HTN, cholesterol, and sugar-sweetened beverage intake

April 2014

Diet Drink Consumption and the Risk of CV Events:
A Report From the Women’s Health Initiative Prevention
Journal of the American College of Cardiology
## Diet Drinks

### Diet Drink Consumption and CV Risks?

<table>
<thead>
<tr>
<th>Diet Drink</th>
<th>CVD Events</th>
<th>CVD Mortality</th>
<th>Overall Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;2/day vs. 0-3/month</td>
<td>↑ (HR 1.3)</td>
<td>↑ (HR 1.5)</td>
<td>↑ (HR 1.3)</td>
</tr>
</tbody>
</table>

April 2014

*Diet Drink Consumption and the Risk of CV Events: A Report From the Women's Health Initiative Prevention Journal of the American College of Cardiology*
Latest Update: Physical Activity
Physical Activity

High Aerobic Exercise Early in Life to Reduce MI Later in Life?

– Cohort study of 743,498 Swedish men (army enrollment), 18 yo
– Aerobic fitness and muscle strength were measured
  • 5 standard deviations
    – 1st = highest performance
    – 5th = lowest performance
– Median follow-up period of 34 years
– Adjustment for age, BMI, diseases, education, BP, socioeconomic factors
– Primary outcome: MI

2014 January
High Aerobic Fitness in Late Adolescence Is Associated With a Reduced Risk of MI Later in Life: A Nationwide Cohort Study in Men
European Heart Journal
High Aerobic Exercise Early in Life to Reduce MI Later in Life?

<table>
<thead>
<tr>
<th>Level of Physical Fitness</th>
<th>MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st} standard (Highest performance)</td>
<td>HR 1.0</td>
</tr>
<tr>
<td>2\textsuperscript{nd} standard</td>
<td>↑ HR 1.16</td>
</tr>
<tr>
<td>3\textsuperscript{rd} standard</td>
<td>↑ HR 1.34</td>
</tr>
<tr>
<td>4\textsuperscript{th} standard</td>
<td>↑ HR 1.39</td>
</tr>
<tr>
<td>5\textsuperscript{th} standard (Lowest performance)</td>
<td>↑ HR 1.69</td>
</tr>
<tr>
<td>For every 1 standard deviation</td>
<td>Δ 18%</td>
</tr>
</tbody>
</table>

2014 January

*High Aerobic Fitness in Late Adolescence Is Associated With a Reduced Risk of MI Later in Life: A Nationwide Cohort Study in Men*

*European Heart Journal*
### Physical Activity

**High Aerobic Exercise Early in Life to Reduce MI Later in Life?**

<table>
<thead>
<tr>
<th>Level of Physical Fitness &amp; BMI</th>
<th>MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Same BMI Group) Lowest performance vs. Highest performance</td>
<td>↑ HR 1.34-2.57 vs. HR 1.0</td>
</tr>
<tr>
<td>(Same performance) Obese (BMI&gt;30) vs. Lean (BMI 18.5)</td>
<td>↑ HR 2.44-4.65 vs. HR 1.0</td>
</tr>
</tbody>
</table>

2014 January

*High Aerobic Fitness in Late Adolescence Is Associated With a Reduced Risk of MI Later in Life: A Nationwide Cohort Study in Men*

*European Heart Journal*
Physical Activity

High Aerobic Exercise Early in Life to Reduce MI Later in Life?

<table>
<thead>
<tr>
<th>Level of Physical Fitness &amp; BMI</th>
<th>MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese (BMI &gt;30) + Highest performance vs. Lean (BMI 18.5) + Lowest performance</td>
<td>↑ HR 1.71</td>
</tr>
<tr>
<td>Overweight (BMI 25-30) + Highest performance vs. Normal (BMI 18.5-25) + Lowest performance</td>
<td>↑ HR 1.31</td>
</tr>
</tbody>
</table>

2014 January

*High Aerobic Fitness in Late Adolescence Is Associated With a Reduced Risk of MI Later in Life: A Nationwide Cohort Study in Men*

*European Heart Journal*
Summary
Summary
General Recommendation

• Dietary Patterns
  • *Emphasize intake of vegetables, fruits, whole grains, legumes, nuts*
    – Include low-fat dairy products, poultry, fish; limit red meats
  • *Reduce Total fat, SFA and TFA*
    – Replace SFA, TFA with MUFA, PUFA (e.g. healthy meats, oils, nuts)
  • *Limit intake of sweets, sugar-sweetened beverages*
  • *Adapt to appropriate calorie requirements to maintain a normal BMI*

• Sodium Intake
  • *Lower sodium intake*
  • *Consume no more than 2,300 mg/day of sodium*
  • *Further reduction to 1,500 mg/day may be beneficial for some*
  • *Combine DASH dietary pattern with lower sodium intake (for BP reduction)*
Summary
General Recommendation

• Supplements
  • Antioxidant supplements are not recommended
  • Beta carotene, Vitamin E, and Vitamin A supplements should be avoided
  • Fish oil and Vitamin D supplements have not been proven to provide CV health benefit
  • Avoid Red Yeast Rice because of highly variable products and possible contamination

• Physical activity
  • Advise aerobic physical activity
  • 3-4 sessions/week, 40 minute/sessions, moderate to vigorous intensity
  • Additional benefits occur with higher intensity, frequency and duration
Resources

• 2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk
  – https://circ.ahajournals.org/content/early/2013/11/11/01.cir.0000437740.48606.d1.full.pdf+html

• Heart Disease and Stroke Statistics 2014 Update: A Report From the American Heart Association,
  – http://circ.ahajournals.org/content/early/2013/12/18/01.cir.0000441139.02102.80.full.pdf+html

• The U.S. Preventive Services Task Force (USPSTF)

• U.S. Department of Agriculture (USDA) National Nutrient Database for Standard Reference

• Dietary Guidelines for Americans, 2010

• CDC Statistics on Nutrition and Diet

• National Heart, Lung, and Blood Institute DASH Eating Plan
  – http://www.nhlbi.nih.gov/health/health-topics/topics/dash/

• National Institute of Health on Supplements
  – http://ods.od.nih.gov/factsheets/list-all/

• Physical Activity Guidelines for Americans 2008
  – http://www.health.gov/paguidelines/guidelines/