Chapter 34

MEDICAL NUTRITION THERAPY FOR CARDIOVASCULAR DISEASE (CVD)
Objectives

**MNT CVD**
- Define the diseases that make up CVD
- Discuss plaque formation and progression of disease
- Explain the lipoproteins linked to CVD and define clinical values
- Define the CVD risk factors- which are modifiable?
- Diet recommendations for CVD
- Pharmacologic and Medical Management for CVD
- Discuss the definition of HTN
- Health Consequences of HTN
- Explain MNT for HTN
- Discuss etiology and treatment of HF
Medical Nutrition Therapy for Cardiovascular Disease

Cardiovascular Disease
1. Atherosclerosis- plaque builds up inside arteries
2. Coronary heart disease (CHD)- plaque builds up inside the coronary arteries
3. Hypertension >120/80mmHg
4. Peripheral vascular disease- plaque builds up in the arteries that carry blood to head, organs, and limbs
5. Heart failure- Can't pump enough blood to meet the body's needs
Medical Nutrition Therapy for Cardiovascular Disease

Cardiovascular Disease
• Remains #1 killer of both men in women in the United States
• Causes one of every 2.9 deaths
• Every minute someone in the United States dies from a coronary event
• Heart disease and stroke cause the most deaths in both sexes of all ethnic groups and increase with age

Types and Incidence of CVD in the United States in 2010
Hypertension: 74,500,000
Coronary heart disease: 17,600,000
Myocardial infarction: 8,500,000
Angina pectoris: 10,200,000
Heart failure: 5,800,000
Stroke: 6,400,000
Atherosclerosis and Coronary Heart Disease

- **Atherogenesis** is the process leading to the development of atherosclerosis
- Chronic, local, inflammatory response
- Narrowed blood vessels that are more rigid
Progression of Atherosclerosis

1. Fatty streak
2. Fibrous plaque
3. Advanced plaque

Tunica adventitia
Tunica media
Tunica intima
Lumen
Normal artery
Complete occlusion Thrombus
Infarction

Years
0 10 20 30 40 50 60
Lipoproteins: packages are made of fat (lipid) on the inside and proteins on the outside.

- Total cholesterol: amount in all lipoprotein fractions
  - LDLs: the primary cholesterol carrier in blood; formed by the breakdown of VLDL
  - HDLs: contain more protein than other lipoproteins; serve as a reservoir of the apolipoproteins that direct lipid metabolism
  - Chylomicrons: transport dietary fat and cholesterol to the liver; major component of triglycerides
  - VLDLs: formed from triglyceride hydrolysis and considered nonatherogenic
CVD Risk Factors

- **Blood lipids**
  - Total cholesterol <200 mg/dL
  - LDL <130 mg/dL or <100 mg/dL in high-risk patients or <70 mg/dL in very high-risk patients
  - HDL >40 mg/dL

- **Lifestyle factors**
  - Tobacco use (35% of smoking deaths are dt CVD)
  - Physical inactivity
  - Poor diet
  - Stress

- **Presence of other diseases**
  - Hypertension
  - Diabetes (Most ppl w DM die of CVD)
  - Obesity (especially abdominal obesity)
  - Metabolic syndrome

- **Age** (>45 for men and >55 for women (menopause))
- **Sex**
- **Genetics**

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**CVD Risk Calculator**

Risk Assessment Tool for Estimating Your 10-year Risk of Having a Heart Attack

The risk assessment tool below uses information from the Framingham Heart Study to predict a person’s chance of having a heart attack in the next 10 years. This tool is designed for adults aged 20 and older who do not have heart disease or diabetes.

- http://cvdrisk.nhlbi.nih.gov/
AHA Diet Recommendations for CVD Risk Reduction

**Use up at least as many calories as you take in.**
- Aim for at least 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity – or an equal combination of both – each week.

**Eat a variety of nutritious foods from all the food groups.**

**Eat an overall healthy dietary pattern that emphasizes:** a variety of
- fruits and vegetables
- whole grains
- low-fat dairy products
- skinless poultry and fish
- nuts and legumes
- non-tropical vegetable oils (canola, olive, peanut, sesame, vegetable)

**Limit:** saturated fat, *trans* fat, sodium, red meat, sweets and sugar-sweetened beverages.

One diet that fits this pattern is the DASH (Dietary Approaches to Stop Hypertension) eating plan.
The healthy DASH diet plan was developed to lower blood pressure without medication in research sponsored by the US National Institutes of Health.

Since then, numerous studies have shown that the DASH diet reduces the risk of many diseases, including some kinds of cancer, stroke, heart disease, heart failure, kidney stones, and diabetes.

The DASH diet eating plan is a diet rich in fruits, vegetables, low fat or nonfat dairy. It also includes mostly whole grains; lean meats, fish and poultry; nuts and beans. It is high fiber and low to moderate in fat.
Medical Nutrition Therapy for Cardiovascular Disease Prevention
DASH Eating Plan

<table>
<thead>
<tr>
<th>Type of food</th>
<th>Number of servings for 1600 - 3100 Calorie diets</th>
<th>Servings on a 2000 Calorie diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and grain products (include at least 3 whole grain foods each day)</td>
<td>6 - 12</td>
<td>7 - 8</td>
</tr>
<tr>
<td>Fruits</td>
<td>4 - 6</td>
<td>4 - 5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>4 - 6</td>
<td>4 - 5</td>
</tr>
<tr>
<td>Low fat or non fat dairy foods</td>
<td>2 - 4</td>
<td>2 - 3</td>
</tr>
<tr>
<td>Lean meats, fish, poultry</td>
<td>1.5 - 2.5</td>
<td>2 or less</td>
</tr>
<tr>
<td>Nuts, seeds, and legumes</td>
<td>3 - 6 per week</td>
<td>4 - 5 per week</td>
</tr>
<tr>
<td>Fats and sweets</td>
<td>2 - 4</td>
<td>limited</td>
</tr>
</tbody>
</table>
MNT for CVD:
Therapeutic Lifestyle Changes (TLC) Dietary Pattern

National Cholesterol Education Program (NECP) and recommended by the ADA

- <7% of your daily calories from saturated fat
- < 200 mg /day of cholesterol
- 25–35% of daily calories from total fat (includes saturated fat calories)
- 50-60% of daily calories from CHO
- 25-30g fiber (10–25 grams as soluble fiber)
- Only enough calories to reach or maintain a healthy weight
- At least 30 minutes of a moderate intensity physical activity, such as brisk walking, on most, and preferably all, days of the week.


<table>
<thead>
<tr>
<th>Change</th>
<th>LDL Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated fat</td>
<td>Decrease to less than 7% of calories</td>
</tr>
<tr>
<td>Dietary cholesterol</td>
<td>Decrease to less than 200 mg/day</td>
</tr>
<tr>
<td>Weight</td>
<td>Lose 10 pounds if overweight</td>
</tr>
<tr>
<td>Soluble fiber</td>
<td>Add 5–10 grams/day</td>
</tr>
<tr>
<td>Plant sterols/stanols</td>
<td>Add 2 grams/day</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

Notice that this amount of LDL reduction from TLC compares well with many of the cholesterol-lowering drugs.
MNT for CVD:
Therapeutic Lifestyle Changes (TLC) Dietary Pattern

- Planned MNT requires 3-6 month time frame
- Lowering SFA intake is first behavior change
- Follow for 6 weeks then reassess LDL levels and prescribe diet changes prn
- Fiber intake is second behavior change
- At subsequent follow up appointments address
  - Weight
  - Diet adherence
  - Label reading
  - Recipe Modification
Pharmacologic Therapy for Cardiovascular Disease

Pharmacologic Management
Diet can minimize need for drug therapy

- Types
  - Bile acid sequestrants:
    - Used to reduce low density lipoprotein (LDL) cholesterol levels. After oral administration, they are not absorbed but bind to bile acids (which contains cholesterol) in the intestine and prevent their reabsorption into the body. The bound complex is insoluble and is excreted in the feces.

  - Nicotinic acid:
    - Nicotinic acid form of niacin reduces the production of triglycerides and VLDL (very low-density lipoprotein, which is converted to LDL in the blood). This leads to decreased LDL ("bad") cholesterol, increased HDL ("good") cholesterol, and lowered triglycerides. Nicotinic acid raises HDL cholesterol

  - HMG CoA reductase inhibitors (statins):
    - A class of drugs that block hydroxy-methylglutaryl-coenzyme A reductase (HMG-CoA reductase). An enzyme in the liver that is responsible for making cholesterol
Medical Therapy for Cardiovascular Disease

Medical Intervention

Percutaneous coronary intervention (PCI): Used to be referred to as angioplasty: Insert a catheter in artery in upper thigh or arm – catheter has a balloon at its tip. Once in place, the balloon is inflated to compress the plaque against the artery wall. This restores blood flow through the artery.

Coronary artery bypass graft (CABG)- the most common type of open-heart surgery in the United States.

A healthy artery or vein from the body is connected, or grafted, to the blocked coronary artery.

The grafted artery or vein bypasses the blocked portion of the coronary artery, creating a new path for oxygen-rich blood to flow to the heart muscle.
Hypertension

- Persistently high arterial blood pressure
- Systolic BP = contraction phase
- Diastolic BP = relaxation phase
- BP is reported as systolic over diastolic in mm/Hg
- 1:3 adults has HTN in US

- Untreated HTN leads to many degenerative diseases including HF, ESRD, peripheral vasular disease,
- Called the “silent killer bc once diagnosed often too late
Causes of HTN

- High Na
- Low fruit and veg
- Smoking
- Inactivity
- Stress
- Obesity
- Genetics

Table 3. Classification of blood pressure for adults

<table>
<thead>
<tr>
<th>Blood Pressure Classification</th>
<th>SBP MMHG</th>
<th>DBP MMHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>&lt;120</td>
<td>and &lt;80</td>
</tr>
<tr>
<td>PREHYPERTENSION</td>
<td>120–139</td>
<td>or 80–89</td>
</tr>
<tr>
<td>STAGE 1 HYPERTENSION</td>
<td>140–159</td>
<td>or 90–99</td>
</tr>
<tr>
<td>STAGE 2 HYPERTENSION</td>
<td>≥160</td>
<td>or ≥100</td>
</tr>
</tbody>
</table>

Medical Nutrition Therapy for HTN

- DASH Diet (Ca, K, Na, Mg)
  - Dietary guidelines: 2400 mg
  - For those with hypertension: 1500 mg
  - DASH diet: 1500 mg
  - 1 tsp salt = 2400 mg

- Weight management
- Alcohol
- Physical activity
- Omega-3 fatty acids

Pharmacologic Therapy for HTN

- Necessary if BP remains elevated after 6-12mo of lifestyle modification

- Diuretics- promote volume depletion and Na loss

- Beta-blockers- "block" the effects of adrenaline on your body's beta receptors. This slows the nerve impulses that travel through the heart. As a result, your heart does not have to work as hard because it needs less blood and oxygen. Beta-blockers also block the impulses that can cause an arrhythmia.

http://www.texasheart.org/
Heart Failure

- Formerly called congestive heart failure
- The heart cannot provide adequate blood flow to the rest of the body
- Fatigue, dyspnea, fluid retention
- Can be right or left sided or both
  - Valves, muscle or blood vessels may cause HF
    - Right-side heart failure occurs if the heart can't pump enough blood to the lungs to pick up oxygen (bc it can’t fill) . Left-side heart failure occurs if the heart can't pump enough oxygen-rich blood to the rest of the body.
    - Right-side heart failure may cause fluid to build up in the feet, ankles, legs, liver, abdomen, and the veins in the neck. Right-side and left-side heart failure also may cause shortness of breath and fatigue.
    - Cor pulmonale- right-side heart failure caused by high blood pressure in the pulmonary arteries and right ventricle (lower right heart chamber)
Heart Failure

- Heart compensates for poor cardiac output
  1. Increases force of contraction
  2. Increases in size
  3. Pumps more often
  4. Stimulates the kidney (conserve H20 and Na)
- Long term survival rates are low
- Risk factors
  - HTN
  - DM
  - CHD
Medical Nutrition Therapy for Heart Failure

- Sodium: Inadequate blood flow to the kidneys is interpreted by the kidney as low blood pressure causing the kidney to release aldosterone, Na resorption, and vasopressin (anti-diuretic hormone) – promotes water conservation. Na and fluid build up in tissue.
  - 1200 (AI) - 2400mg/day
- Alcohol: Raises blood pressure
  - Eliminate or restrict to 1 drink/day women, 2 men
Medical Nutrition Therapy for HF

Calories- USE DRY WEIGHT

- If obese restrict to 1000-1200kcal/day to reduce burden on heart- DO NOT ALLOW PATIENT TO BECOME MALNOURISHED
- If heart failure is severe kcal needs are increased by 30-50% d/t increased work of lungs and heart start with 21-35kcal/kg

- Cardiac cachexia
  - End result of HF in 10-15% patients- weight loss of LBM
  - Energy needs 1.6-1.8x higher in these patients