Hyperlipidemia and Hypertension: Current Recommendations and Management
Hypertension
Objectives

- Define hypertension
- Classify hypertension based on blood pressure measurements
- State the mechanism of action, dosing, adverse effects, and counseling points for currently available anti-hypertensives
- Apply the information presented to enhance your daily practice
Hypertension Background

- Hypertension is an increasingly important and public health issue, with approximately 2 million new cases that occur each year.

- Starting at the age of 55 years individuals have 90% chance of developing hypertension along with related cardiovascular complications, such as stroke or myocardial infarction.

The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) JAMA. 2002;288:2981-2997
Hypertension Background

- It is estimated that 50 million people over the age of 25 have hypertension and only half of them are receiving antihypertensive medications.

- Risk of stroke, myocardial infarction, angina, or heart failure from a cardiovascular cause is directly related to blood pressure (BP), which can begin at a BP of 115/75, and double with each incremental increase of 20/10 mm of Hg.
Patient Case

- 50 year-old white male
- Admitted for new onset diabetes mellitus
- PMH: ischemic stroke (2006)
- Vitals:
  - BP = 154/100, HR = 86
  - BP = 156/102, HR = 82
- Medications:
  - Aspirin 81 mg PO once daily

1. Does this patient have hypertension (HTN)? **YES**

2. How would you stage this patient's hypertension? **Stage 2 HTN**
Step 1: Define Hypertension

- BP > 140/90
- Taking antihypertensive drug therapy

<table>
<thead>
<tr>
<th>Blood Pressure Classification</th>
<th>Systolic BP</th>
<th>Diastolic BP</th>
<th>Preferred Initial Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120</td>
<td>&lt; 80</td>
<td>None</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>80-89</td>
<td>None, unless clinically indicated</td>
</tr>
<tr>
<td>Stage 1 HTN</td>
<td>140-159</td>
<td>90-99</td>
<td>Thiazide</td>
</tr>
<tr>
<td>Stage 2 HTN</td>
<td>&gt;160</td>
<td>&gt;100</td>
<td>Thiazide + other</td>
</tr>
</tbody>
</table>
Step 1: Define Hypertension

- BP is equal to cardiac output times peripheral resistance.
- Cardiac output is defined as the volume of blood ejected per unit of time, which is determined by HR, contractility, and filling pressure.
- HR is controlled by the autonomic nervous system, more specifically the B1 receptors in the heart, when stimulated can cause an increase in heart rate. Similarly contractility is controlled by the stimulation of the beta 1 receptors in addition to the renin angiotensin aldosterone system, when stimulated can cause increased contractility.
Step 1: Define Hypertension

- And lastly filling pressure is controlled by blood volume and venous tone. Peripheral resistance is the other half of the equation and can be defined as the sum of resistance of all peripheral vasculature in the systemic circulation. This is determined by the arteriolar volume, which increases when vasoconstriction of the vessels occur by stimulation of norepinephrine and epinephrine.
Blood Pressure =

- Cardiac Output
  - Heart Rate
  - Contractility
  - Filling Pressure
    - Blood volume
    - Venous tone

- Peripheral Resistance
  - Arteriolar volume
Step 2: Identify Risk Factors

- **Modifiable:**
  - Smoking
  - Obesity (BMI > 30 kg/m²)
  - Physical inactivity
  - High sodium intake
  - Alcohol consumption
  - Diabetes Mellitus

- **Non-modifiable:**
  - Age > 55 (men); age > 65 (women)
  - Family history of cardiovascular disease
  - Microalbuminuria or estimated GFR < 60 ml/min
  - Gender: men have increased risk
Step 3: Determine the Etiology

- The next step in managing an individual with hypertension is to determine the etiology
  - Primary (90%)
    - “Essential”
      - No identifiable cause
      - Most common type of hypertension accounting for 90% of all cases
    - Unknown cause
      - most likely related to environmental and genetic factors
Step 3: Determine the Etiology

- Secondary hypertension is the result of an anatomical or pathophysiologic process, that typically does not respond to antihypertensive medications, which instead may be curable by other means. These include:
  - Secondary (10%)
    - Chronic kidney disease
    - Most common cause of secondary hypertension
    - Sleep apnea
    - Which can activate the sympathetic nervous system leading to increase
    - Medications
    - Thyroid dysfunction
    - Pregnancy
    - “White coat effect” Elevated BP in clinical setting, but not in other setting
Step 3: Determine the Etiology

• As stated in the previous slide elevated BP may be the result of certain medications.
• Many prescription drugs, over the counter, or herbals can affect BP and complicate BP control in hypertensive agents. For example:
  – NSAIDS, which is a common medication that many patients in our hospital are on, increases BP by causing fluid retention and vasoconstriction in the kidney
  – In addition, immunosuppressant such as tacrolimus and cyclosporine affect BP by decreasing water and sodium excretion and increased prostaglandin synthesis,
  – Other medications that are commonly used that can increase BP include erythropoietin, which is simply due to mechanism of the medication of increasing blood volume in an individual, increased blood volume leads to increased BP.
  – And lastly, SNRI such as venlafaxine increase BP by increasing levels of norepinephrine, which lead to vasodilation of vessels.
Drug Induced Hypertension

Here is a list of the most common medications that can cause drug induced hypertension

- Steroids
- NSAIDS
- Erythropoietin
- Cyclosporine/ tacrolimus
- Estrogens
- Oral Contraceptives
- Tricyclic Antidepressants
- Anorexiants
- Decongestants
- Thyroid Hormones
- MAO Inhibitors
- Cocaine
- Alcohol
- Venlafaxine/ duloxetine
- Caffeine
- Ephedra
- Licorice
Step 4: Assess for Compelling Indication

<table>
<thead>
<tr>
<th>Compelling Indication</th>
<th>Diuretics</th>
<th>Beta Blockers</th>
<th>ACE Inhibitors</th>
<th>ARB</th>
<th>CCB</th>
<th>Aldosterone Antagonists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney Disease</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Failure</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Coronary Disease (CAD)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Post-MI</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Stroke history</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 5: Define Treatment Goal

- In general, BP goal < 140/90
- In presence of other disease states:

<table>
<thead>
<tr>
<th>Disease State</th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes(^1)</td>
<td>&lt; 140/80</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>&lt; 130/80</td>
</tr>
<tr>
<td>1 gm/day urine protein</td>
<td>&lt; 125/75</td>
</tr>
</tbody>
</table>

1. Standards of Care for Diabetes, ADA 2013
Lifestyle Modifications

- The adaptation of lifestyle modifications is important in the prevention/management of hypertension Recommended in:
  - Pre-hypertension
  - Stage 1 Hypertension
  - Stage 2 Hypertension

<table>
<thead>
<tr>
<th>Modification</th>
<th>SBP Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>5-20 mm Hg/ 10 kg lost</td>
</tr>
<tr>
<td>DASH diet</td>
<td>8-14 mm Hg</td>
</tr>
<tr>
<td>Physical activity</td>
<td>4-9 mm Hg</td>
</tr>
<tr>
<td>Sodium restriction</td>
<td>2-8 mm Hg</td>
</tr>
<tr>
<td>Limit alcohol consumption</td>
<td>2-4 mm Hg</td>
</tr>
</tbody>
</table>
Prevent Complications

- Uncontrolled blood pressure can lead to the development of:
  - Brain (stroke, transient ischemic attack)
  - Nephropathy
  - Retinopathy
  - Peripheral arterial disease
  - Heart Disease:
    - Left ventricular hypertrophy
    - Myocardial Infarction
    - Angina
    - Need for revascularization
    - Heart Failure

The prevention of cardiovascular complications is important in reducing morbidity and mortality in patients with hypertension.
Goals of Therapy

Goals of therapy for patients with hypertension includes:

• Achieve recommended blood pressure goals
  – 140/80 for general medical patients
  – 130/80 for patients with diabetes and CKD
  – 125/75 for patients with protein in the urine

• Prevent morbidity and mortality by reducing the risk of complications

• Prevent / reduce target organ damage

• Select cost-effective therapy
Antihypertensive Choices

- Diuretics
- ACE Inhibitors (ACEI)
- Angiotensin II receptor blockers (ARB)
- Direct renin inhibitor
- β-blockers
- Calcium channel blockers
- Alpha-blockers
- Centrally acting α-agonists
- Direct vasodilators
## Thiazide & Thiazide-Like Diuretics

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Oral Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochlorothiazide (HydroDIURIL®)</td>
<td>12.5 - 25</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Chlorthalidone (Hygroton®)</td>
<td>12.5 – 25</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Chlorothiazide (Diuril®)</td>
<td>125 – 500</td>
<td>1-2</td>
<td>Oral, IV</td>
</tr>
<tr>
<td>Metolazone (Zaroxolyn®)</td>
<td>2.5 – 5</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Indapamide (Lozol®)</td>
<td>1.25 – 2.5</td>
<td>1</td>
<td>Oral</td>
</tr>
</tbody>
</table>
MECHANISM OF ACTION OF DIURETICS

These diuretics work in the distal tubules of the kidney enhancing sodium and water excreting with the transport of sodium ions across the renal epithelium leading to decreased blood volume and decreased cardiac output, leading to:

Blood Pressure
Thiazide Diuretics

- Reduce morbidity and mortality in HTN
- “First-line” anti-hypertensives
- ↓ incidence of stroke when combined with ACEI
- Lower doses less likely to cause metabolic effects & electrolyte disturbances
- Better anti-hypertensive than loop diuretics
- Very effective in African American patients
- May slow bone loss and reduce risk of fractures
Adverse Effects

Many of the side effects of thiazide diuretics are related to the mechanism of action of electrolyte absorption and excretion these include:

- Hypokalemia
- Hypomagnesemia
- Hyperglycemia
- Hyperuricemia
- Hyponatremia
- Hypercalcemia
- Rash
- Pancreatitis
- Photosensitivity
- Hypercholesterolemia
Monitoring

Monitoring of Thiazide diuretics include:

- Blood pressure
- Serum electrolytes
  - Especially potassium
- Serum creatinine
  - Since it can increase the serum creatinine
- Uric acid
  - Routinely in patients with gout
Patient Counseling Points

Counseling patients on the use of Thiazide diuretics is very important in optimizing therapy for the benefit of the patient such as:

- Take early in the day to avoid nocturia
  - associated with increased amount of diuresis
- Consider using sunscreen
- Report problems with muscle cramps
- Encourage regular check-ups
  - Blood pressure monitoring
  - Electrolytes and glucose monitoring
# Loop Diuretics

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Oral Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furosemide (Lasix®)</td>
<td>20 – 80</td>
<td>1-2</td>
<td>Oral, IV</td>
</tr>
<tr>
<td>Torsemide (Demadex®)</td>
<td>2.5 – 10</td>
<td>1</td>
<td>Oral, IV</td>
</tr>
<tr>
<td>Bumetanide (Bumex®)</td>
<td>0.5 – 2</td>
<td>1-2</td>
<td>Oral, IV</td>
</tr>
<tr>
<td>Ethacrynic acid (Edecrin®)</td>
<td>50 – 200</td>
<td>1-2</td>
<td>Oral, IV</td>
</tr>
</tbody>
</table>
Loop Diuretics

- Better at mobilizing fluid vs. thiazides
- Shorter duration of action vs. thiazides
- Still effective when CrCl < 30 ml/min
- May require potassium supplementation
- Diuretic of choice in heart failure
- Less likely to cause hypercalcemia
Adverse Effects

- Adverse Effects of loop diuretics are very similar to that of Thiazide diuretics
- They are also associated with electrolyte imbalances such as:
  - Hypomagnesaemia
  - Hyponatremia
  - Hypokalemia
  - Hyperuricemia
- Patient may experience:
  - Pancreatitis
  - Dehydration
  - Rash
  - Hyperglycemia
  - Metabolic alkalosis
Monitoring

- It’s very important to monitor serum electrolyte in patients taking loop diuretics

- Ototoxicity in patients with high doses
  - Which is usually self limiting and can be reversed
Patient Counseling Points

- Take early in the day to avoid nocturia
- Consider using sunscreen
- Report problems with muscle cramps
- Rise slowly from a lying or sitting position
- Encourage regular check-ups
  - Blood pressure monitoring
  - Electrolyte monitoring
# Potassium-Sparing Diuretics

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Oral Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spironolactone (Aldactone®)</td>
<td>25 – 50</td>
<td>1-2</td>
<td>Oral</td>
</tr>
<tr>
<td>Eplerenone (Inspra®)</td>
<td>50 – 100</td>
<td>1-2</td>
<td>Oral</td>
</tr>
<tr>
<td>Triamterene (Dyrenium®)</td>
<td>50 – 100</td>
<td>1-2</td>
<td>Oral</td>
</tr>
<tr>
<td>Amiloride (Midamor®)</td>
<td>5 – 10</td>
<td>1-2</td>
<td>Oral</td>
</tr>
</tbody>
</table>
Potassium Sparing Diuretics

- Weak antihypertensive agents
- May be used in combination with thiazides to prevent hypokalemia
- Use caution in renal dysfunction
- Use caution combining with ACEI or ARB
Adverse Effects

The most common side effect associated with potassium diuretics include:

- Hyperkalemia
- Rash
- Gastrointestinal disturbances
- Gynecomastia
- Hirsuitism
- Hypertriglyceridermia
Monitoring

Monitoring parameters for these medications primarily include serum electrolytes more specifically:

- Potassium
  - Discontinue with potassium in greater than 5.5
- Serum creatinine
Counseling Points

- Avoid excessive ingestion of food high in potassium and use of salt substitutes
- Take with food (spironolactone) to reduce the incidence of GI disturbances
- Take early in day to avoid nocturia
Angiotensin Converting Enzyme Inhibitors (ACE-I)

- Captopril (Capoten®)
- Enalapril (Vasotec®)
- Lisinopril (Zestril®)
- Enalaprilat (Vasotec® IV)
- Benazepril (Lotensin®)
- Fosinopril (Monopril®)

- Moexipril (Univasc®)
- Quinapril (Accupril®)
- Ramipril (Altace®)
- Trandolapril (Mavik®)
- Perindopril (Aceon®)
# Angiotensin Converting Enzyme Inhibitors (ACE-I)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lisinopril (Zestril®)</td>
<td>10 – 40</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Enalapril (Vasotec®)</td>
<td>2.5 – 40</td>
<td>1-2</td>
<td>Oral</td>
</tr>
<tr>
<td>Captopril (Capoten®)</td>
<td>25 – 100</td>
<td>2-3</td>
<td>Oral</td>
</tr>
<tr>
<td>Enalaprilat (Vasotec® IV)</td>
<td>0.625 – 5</td>
<td>4</td>
<td>IV</td>
</tr>
</tbody>
</table>
Angiotensin Converting Enzyme Inhibitors (ACEI)

- **Mechanism of action:**
  - Inhibit angiotensin-converting enzyme (ACE)
    - Decrease PVR
    - Decrease sodium and water retention

- **Efficacy:**
  - Caucasians > African Americans
  - young = elderly
  - combination therapy

- **No effect on lipids**
- **May improve glucose control**
Adverse Effects

• ACEI are typically well tolerated, but can be associated with potentially dangerous side effects if not monitored appropriately. These most commonly include:
  • Hyperkalemia
  • Hypotension
  • Cough
    – Dry cough which can occur in up to 20% of patients
  • ↑ Serum creatinine
  • Angioedema
    – which is considered a true allergy to the medication and more likely to occur in AA symptoms include lip and tongue swelling associated with difficulty breathing, renal artery stenosis, and loss of taste
# Angiotensin Converting Enzyme Inhibitors (ACE-I)

**Preferred**
- DM (type 1 or 2)
- Heart failure
- Post-MI
- Chronic renal insufficiency
- Post-Stroke

**Not preferred**
- Bilateral RAS or RAS in a patient with a single kidney
- Pregnancy
- Angioedema
- Potassium > 5.5
- Acute renal failure

DM = diabetes mellitus  
RAS = renal artery stenosis
Angiotensin II Receptor Blockers (ARB)

- Candesartan (Atacand®)
- Valsartan (Diovan®)
- Losartan (Cozaar®)
- Irbesartan (Avapro®)
- Olmesartan (Benicar®)
- Telmisartan (Micardis®)
- Eprosartan (Teveten®)
Angiotensin II Receptor Blockers (ARB)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan (Atacand®)</td>
<td>8 – 32</td>
<td>1</td>
<td>Oral</td>
</tr>
</tbody>
</table>
# Angiotensin II Receptor Blockers (ARB)

<table>
<thead>
<tr>
<th>Preferred</th>
<th>Not preferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Type 2 Diabetic Nephropathy</td>
<td>• Bilateral RAS or RAS in a patient with a single kidney</td>
</tr>
<tr>
<td>• Intolerance to ACEI</td>
<td>• Pregnancy</td>
</tr>
<tr>
<td>• Chronic renal insufficiency</td>
<td>• Angioedema</td>
</tr>
<tr>
<td></td>
<td>• Potassium &gt; 5.5</td>
</tr>
<tr>
<td></td>
<td>• Acute renal failure</td>
</tr>
</tbody>
</table>
Adverse Effects

- ARBS have the lowest incidence of side effects compared to other antihypertensive agents, but are very similar to ACEI in regards to side effects, including:
  - Hypotension
  - Hyperkalemia
- Because ARDS do not affect bradykinin they do not have the potential to illicit a dry cough like ACEI
- Other side effects include:
  - Angioedema
  - Renal artery stenosis
Direct Renin Inhibitors (DRI)

- Direct renin inhibitor (DRI)
  - Decreases angiotensin II
    - Decrease PVR
    - Decrease sodium and water retention
- May combine with other anti-hypertensives
- Aliskiren (Tekturna®)
  - Dosing:
    - Initial: 150 mg once daily
    - Maximum: 300 mg once daily
- Adverse Effects:
  - Diarrhea - Dizziness - Headache
**Beta Blockers**

- **β-1 selective**
  - Atenolol (Tenormin®)
  - Metoprolol (Lopressor®)
  - Betaxolol (Kerlone®)
  - Bisoprolol (Zebeta®)
  - Nebivolol (Bystolic®)

- **α-β blocker**
  - Carvedilol (Coreg®)
  - Labetolol (Normodyne®)

- **Non-selective**
  - Nadolol (Corgard®)
  - Penbutolol (Levatol®)
  - Pindolol (Visken®)
  - Propranolol (Inderal®)
  - Timolol (Blocadren®)
  - Acebutolol (Sectral®)
Activation of Beta-1 Receptors on the heart ↓ Cardiac output

Renin

↓ Blood volume

↓ PVR

Decrease in blood pressure
# Common JHS Oral Beta Blockers

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Oral Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol (Lopressor®)</td>
<td>25 – 100</td>
<td>2</td>
<td>Oral</td>
</tr>
<tr>
<td>Metoprolol ER (Toprol-XL®)</td>
<td>25 – 100</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Atenolol (Tenormin®)</td>
<td>25 – 100</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Carvedilol (Coreg®)</td>
<td>6.25 – 25</td>
<td>2</td>
<td>Oral</td>
</tr>
<tr>
<td>Labetalol (Normodyne®)</td>
<td>200 – 600</td>
<td>2</td>
<td>Oral</td>
</tr>
</tbody>
</table>
# Common JHS IV Beta Blockers

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual IV Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol (Lopressor®)</td>
<td>1.25 – 5</td>
<td>4</td>
<td>IV</td>
</tr>
<tr>
<td>Atenolol (Tenormin®)</td>
<td>1.25 – 5</td>
<td>4</td>
<td>IV</td>
</tr>
<tr>
<td>Labetalol (Normodyne®)</td>
<td>10 – 20</td>
<td>*</td>
<td>IV</td>
</tr>
<tr>
<td>Esmolol (Brevibloc)</td>
<td>50 mcg/kg/min-300 mcg/kg/min</td>
<td>*</td>
<td>IV</td>
</tr>
</tbody>
</table>
Place in Therapy

**Preferred**
- Angina
- Post-MI
- Hyperthyroidism
- Essential tremor
- Migraine (prophylaxis)
- Preoperative HTN
- Arrhythmias

**Use with Caution**
- Severe brochospastic disease
- Bradycardia (HR < 60)
- 2nd or 3rd degree heart block
Adverse Effects

Adverse effect of Beta Blockers are associated with the blockage effect of the medications including:

- Bradycardia
- Heart block
- Mask symptoms of hypoglycemia
- Hyperlipidemia
- Bronchospasm
- Fatigue
- Sexual dysfunction

• Do not stop abruptly
• Sedation precaution
Monitoring Parameters

- Blood pressure
- Heart rate
- Glucose levels
- Lipid panel
## Calcium Channel Blockers

### Dihydropyridines
- Amlodipine (Norvasc®)
- Felodipine (Plendil®)
- Nicardipine (Cardene®)
- Nifedipine (Adalat CC®)
- Nimodipine (Nimotop®)
- Isradipine (DynaCirc®)
- Nisoldipine (Sular®)
- Clevidipine (Cleviprex®)

### Non-Dihydropyridines
- Verapamil (Calan®)
- Diltiazem (Cardizem®)

These medications are typically used in combination or in replacement of other antihypertensive agents that cannot be tolerated.
Calcium Channel Blockers: Mechanism of Action

• The Calcium Channel Blockers inhibit the influx of Ca across the cell membrane in cardiac and smooth muscle

• This leads to decrease heart rate/contractility as seen in the nondihydropyriding Calcium Channel Blockers such as:
  – verapamil
  – Diltiazem

• Where as the dihydropyridines are more associated with decrease in peripheral resistance since they are more selective for smooth muscle
Calcium Channel Blockers: Mechanism of Action

<table>
<thead>
<tr>
<th></th>
<th>Verapamil</th>
<th>Diltiazem</th>
<th>DHP(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ HR</td>
<td>++++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>↓ Contractility</td>
<td>++++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>↓ PVR(^2)</td>
<td>+</td>
<td>++</td>
<td>++++</td>
</tr>
</tbody>
</table>

1. DHP = dihydropyridines (ex= nifedipine, amlodipine)
2. PVR = peripheral vascular resistance
Calcium Channel Blockers: Dihydropriyridines

Evidence based indications for Dihydropyridines includes:

- **Isolated Systolic Hypertension (ISH)**
  - Especially in older patients in which a long acting CCb should be considered

- **Angina**

- **Angina with HF** (amlodipine and felodipine)

- **African Americans population**
Calcium Channel Blockers: Non-Dihydropyridines

<table>
<thead>
<tr>
<th>Preferred</th>
<th>Not preferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Angina</td>
<td>- Systolic heart failure</td>
</tr>
<tr>
<td>- Tachyarrhythmias</td>
<td>- Bradycardia</td>
</tr>
<tr>
<td>- DM with proteinuria (after ACEI / ARB)</td>
<td>- 2nd or 3rd degree heart block</td>
</tr>
<tr>
<td>- Post-MI</td>
<td></td>
</tr>
<tr>
<td>- African Americans</td>
<td></td>
</tr>
</tbody>
</table>
Adverse Effects

Dihydropyridines
Smooth Muscle
- peripheral edema
- reflex tachycardia
- dizziness
- flushing
- headache

Non-Dihydropyridines
Heart
- bradycardia
- constipation
- gingival hyperplasia
- AV block
- dizziness
Counseling Points

- Report increase swelling of the extremities
- Constipation (verapamil)
- Home monitoring:
  - Heart rate (non-dihydropyridines)
  - Blood pressure (all)
Alpha Blockers

- Alpha blockers are potent vasodilators that cause relaxation of the vascular muscle and arteriolar vessels.

- Currently available alpha blockers include:
  - Doxazosin
  - Terazosin
  - Prazosin

- These medication are all dosed differently, but are all available as an oral formulation. They are not indicated for first line therapy in patients with hypertension.
## Alpha Blockers

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Oral Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doxazosin (Cardura®)</td>
<td>1 – 16</td>
<td>1</td>
<td>Oral</td>
</tr>
<tr>
<td>Terazosin (Hytrin®)</td>
<td>1 - 20</td>
<td>2</td>
<td>Oral</td>
</tr>
<tr>
<td>Prazosin (Minipress®)</td>
<td>2 – 20</td>
<td>3</td>
<td>Oral</td>
</tr>
</tbody>
</table>

- Potent vasodilation by:
  - Vascular smooth muscle relaxation
  - Arteriolar vessels
Alpha Blockers

- ALLHAT results in 2000 showed ↑ risk of:
  - Stroke
  - Heart Failure
  - ↑ angina
  - ↑ coronary revascularization

- No longer recommended as monotherapy
- May have a favorable effect on lipid profile
- Useful in relieving symptoms of BPH

BPH = benign prostatic hyperplasia
Alpha Blockers

• Rarely use as 1st-line therapy
  – Useful if patient has BPH (with another agent)
  – Refractory to other agents

• Dosing:
  – start low and give at bedtime
  – need to titrate with standing BP
Adverse Effects

- “First-dose” effects: 16-19%
  - Dizziness
  - Palpitations
  - Orthostatic hypotension / syncope
- Headache: 10-14%
- CNS effects
- Reflex tachycardia
- Tolerance / tachyphylaxis
Central Acting $\alpha_2$-agonists

- **Actions:**
  - $\downarrow$ Blood Pressure
    - $\downarrow$ HR
    - $\downarrow$ PVR
    - $\downarrow$ Renin release

- **Examples:**
  - Clonidine (Catapres®)
  - Guanfacine (Tenex®)
  - Guanabenz (Wytensin®)
  - Metyldopa (Aldomet®)

Central acting alpha 2 agonist decrease blood pressure by stimulating $\alpha_2$ adrenergic receptors in the brain; This reduces sympathetic outflow decreasing HR, PVR $<$ and renin release.
Central Acting $\alpha_2$-agonists

- Not first-line agents unless necessary to treat HTN unresponsive to all other agents
- Place in Therapy:
  - hard to control BP (renal disease)
  - hypertensive urgency (clonidine)
- Methyldopa:
  - Useful in pregnancy
  - Contraindicated in liver disease
- Adverse Effects:
  - Sedation, dizziness, fatigue, depression, dry mouth, bradycardia, rebound hypertension
Counseling Points

• Do not stop abruptly
  – Rebound hypertension
• Clonidine patch applied once weekly
• It is important to counsel these patients on sedation precaution
• Educate the patient on the incidence of flu like symptoms and hepatic dysfunction, which is most likely seen in methyldopa
Direct Vasodilators

• Another agent not indicated as 1st line for the treatment of hypertension:
• Direct vasodilators
  – work by relaxing arteriolar smooth muscle resulting in vasodilation and decreased BP,
  – these medications include:
    • Hydralazine, which is available as PO and IV
    • Monixidil which is only available in an oral formulation
## Direct Vasodilators

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual Dose (mg)</th>
<th>Daily Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydralazine (Apresoline®)</td>
<td>10 – 100</td>
<td>2-4</td>
<td>Oral</td>
</tr>
<tr>
<td>Minoxidil (Loniten®)</td>
<td>2.5 – 80</td>
<td>1-2</td>
<td>Oral</td>
</tr>
<tr>
<td>Hydralazine (Apresoline®)</td>
<td>10 – 20</td>
<td>4-6</td>
<td>IV</td>
</tr>
</tbody>
</table>

Work by relaxing arteriolar smooth muscle resulting in vasodilation and decreased BP, these medications include hydralazine, which is available as PO and IV, and Monixil which is only available in an oral formulation.
Direct Vasodilators

- Mechanism of action:
  - Directly relax arterial smooth muscle
  - ↓ PVR
- Useful in refractory hypertension
  - minoxidil > hydralazine
- Not 1st line agents
- Adverse effects:
  - Reflex tachycardia
  - Headache
  - Fluid retention

These medications are useful in treating patients with refractory hypertension and are usually not given until an individual has received other antihypertensive medications.
Recommended Initial Treatment

**Without** Compelling Indications

**Stage 1 Hypertension**
- Thiazide-type diuretics
- May consider ACEI, ARB, BB, CCB, or combination

**Stage 2 Hypertension**
- Two-drug combination
- Usually thiazide-type diuretic and:
  - ACEI
  - ARB
  - BB
  - CCB

**With** Compelling Indications

Select drug(s) for the compelling indications

Optimize dosages or add additional drugs until goal blood pressure achieved
Patient Education

- Educate patients about their disease and treatment regimens
  - Lifestyle Modifications
  - Monitoring
  - Adherence
  - Common side effects
Here is a list of medications that should not be crushed, these medications are all extended release or sustained release formulations that when crushed would cause an increase in drug in drug concentration in the body leading to toxic levels and adverse effects.

- Adalat CC
- Cardene SR
- Cardizem CD
- Cardizem XL
- Cartia XT
- Inderal LA
- Innopran XL
- Metoprolol ER
- Procardia XL
Hypertensive Emergency & Urgency

- Emergency: Patients that do not take their meds or can’t afford their med will sometimes present with a hypertensive crisis
  - Acutely elevated BP, with BP > 180/110 mmHg
  - Target organ damage (TOD) is present:
    - Brain: stroke, HTN encephalopathy
    - Heart: ACS, HF, aortic dissection
    - Kidney: decreased UOP, acute renal failure
    - Eyes: papilledema, retinopathy
Hypertensive Emergency & Urgency

- **Treatment Goals**
  - **Emergency**
    - Reduction of MAP no greater than a 25% within 30-60 minutes.
  - **Urgency**
    - MAP reduction to goal range in 24 hours

- **Medications**
  - IV used for hypertensive emergency
  - IV or PO used for hypertensive urgency
  - Selected based on co-morbidities & TOD
Conclusions

• Hypertension affects a large percentage of our patient population
• Tight hypertensive control decreases morbidity and mortality
• Most patients will require > 2 medications
• Selecting the most appropriate antihypertensive regimen is key
Hyperlipidemia: Current Recommendations and Treatment
Objectives

At the end of this presentation participants should be able to:

- Define the term hyperlipidemia and the differences between bad vs. good cholesterol
- Identify secondary causes of lipoprotein abnormalities
- Describe the current ATP III cholesterol goals for the management of dyslipidemia
- Explain pharmacologic and non-pharmacologic approaches to managing the disease
Introduction

- Coronary artery disease (CAD) is the leading cause of death in the U.S.
- Estimated direct and indirect cost of CAD in the U.S. for 2008 was $448.5 billion
- Hyperlipidemia is a major risk factor for both CAD and Stroke
- Nearly 105 million American adults have total blood cholesterol levels (TC) of 200 mg/dL or higher
Hyperlipidemia

- Elevation of one or more cholesterol, cholesterol esters, phospholipids, or triglycerides
- Lipoproteins are responsible for transporting cholesterol and other fats through the bloodstream
  - Most commonly monitored LDLs and HDLs
- Six types exist
LDL (Bad Cholesterol)

- Carry the largest amount of cholesterol in the blood
- Responsible for transporting it to extra-hepatic tissue and depositing it in arterial walls
- Can lead to plaque formation → atherosclerosis → MI + Stroke
HDL (Good Cholesterol)

- Carry approximately 1/3 to 1/4 of blood cholesterol
- Transport cholesterol from the walls of the arteries through the bloodstream to the liver for excretion
- Remove harmful LDL from the blood
- Prevents fatty build-up and formation of plaque in the walls of arteries
Triglycerides

- The body converts excess calories, sugar, and alcohol into triglycerides, a type of fat that is carried in the blood and stored in fat cells throughout the body.
- People who are overweight, inactive, smokers, or heavy drinkers tend to have high triglycerides, as do those who eat a very high-carb diet.
- A triglycerides score of 150 or higher puts you at risk for metabolic syndrome, which is linked to heart disease and diabetes.
How Does Atherosclerosis Start?

- Complex process of damage to the inner layer of the artery (endothelium)
  - Elevated levels of lipids in the blood
  - Tobacco smoke
  - High blood pressure
- Fat, cholesterol, fibrin, platelets and other substances are deposited in the artery wall
- Endothelium becomes markedly thickened
- Tobacco smoke speeds up the growth of atherosclerosis
Causes of Hyperlipidemia

- Hereditary (familial)
- Secondary
  - Diet
  - Hypothyroidism
  - Nephrotic syndrome
  - Anorexia nervosa
  - Obstructive liver disease
  - Acute hepatitis
  - Obesity
  - Alcohol
- Diabetes
- Pregnancy
- Systemic lupus erythematosus (SLE)
- Drugs
  - HIV meds (protease inhib.)
  - Thiazide diuretics
  - Beta blockers
  - Steroids
  - Progesterone/estrogen
  - Sirolimus/tacrolimus
## Dietary Sources of Cholesterol

<table>
<thead>
<tr>
<th>Type of Fat</th>
<th>Main Source</th>
<th>Effect on Cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monounsaturated</td>
<td>Olives, olive oil, canola oil, peanut oil, cashews, almonds, peanuts and most other nuts; avocados</td>
<td>Lowers LDL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raises HDL</td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>Corn, soybean, safflower and cottonseed oil; fish</td>
<td>Lowers LDL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raises HDL</td>
</tr>
<tr>
<td>Saturated</td>
<td>Whole milk, butter, cheese, and ice cream; red meat; chocolate; coconuts, coconut milk, coconut oil, egg yolks, chicken skin</td>
<td>Raises both LDL and HDL</td>
</tr>
<tr>
<td>Trans</td>
<td>Most margarines; vegetable shortening; partially hydrogenated vegetable oil; deep-fried chips; many fast foods; most commercial baked goods</td>
<td>Raises LDL</td>
</tr>
</tbody>
</table>
Adult Treatment Panel Guidelines (ATP III) Recommendations

• Complete lipid profile after 9- to 12-hrs fast
  – a. Screen every 5 years in patients 20 y/o or older for acceptable values

• Identify presence of clinical atherosclerotic disease (CHD risk equivalent) that confers high risk for coronary heart disease (CHD) events:
  – Clinical CHD
  – Symptomatic carotid artery disease
  – Peripheral arterial disease
  – Abdominal aortic aneurysm
  – Diabetes
  – Multiple risk factors that confer a 10-year risk for CHD > 20%
ATP III
Classification of Total Cholesterol, Triglycerides, HDL Cholesterol and LDL Cholesterol
HDL Cholesterol

60↑ Optimal
40↓ Low for men
50↓ Low for women
Major Risk Factors Other than a High LDL Cholesterol for CHD

- Cigarette smoking
- Hypertension (BP ≥ 140/90 or on antihypertensive medication)
- Low HDL (< 40 mg/dL)
- Age
  - Men ≥ 45 yrs; Women ≥ 55 yrs
- Family history for premature CHD
  - Men first degree relative < 55 y/o
  - Female first degree relative < 65 y/o
LDL Goals: Low Risk

- 0-1 Risk Factors:
  - LDL goal is 160
  - If LDL ≥ 160: Initiate TLC (therapeutic lifestyle changes)
  - If LDL ≥ 190: Initiate pharmaceutical treatment
LDL Goals: Moderate Risk

- 10-y CHD risk < 10%
  - LDL goal is < 130
  - If LDL ≥ 130: Initiate TLC
  - If LDL ≥ 160: Initiate pharmaceutical treatment

- 10-y CHD risk of 10%-20%
  - LDL goal is <130
  - If LDL ≥ 130: Initiate TLC and initiate pharmaceutical treatment
LDL Goals: High Risk

- CHD, CHD Risk Equivalent, or 10-y CHD risk > 20%
  - LDL goal is <100 (or 70)
  - If LDL ≥ 100: Initiate TLC and pharmaceutical treatment
LDL Goal for Very High Risk Patients

- Less than 70 mg/dL
  - Acute Coronary Syndrome (UA, NSTEMI, STEMI)
  - CAD plus multiple major risk factors (diabetes)
  - CAD plus pt continue smoking
  - CAD plus multiple risk factors of the metabolic syndrome
Hyperlipidemia Management

Ultimate Goal

• Reduce the risk of first or recurrent events such as:
  – Myocardial Infarction
  – Angina
  – Heart Failure
  – Ischemic Stroke
  – Peripheral Arterial Disease (carotid stenosis, abdominal aortic aneurysm)
Treatment of Hyperlipidemia

- **Lifestyle Modification**
  - 1. Low-cholesterol diet
    - Saturated fat < 7% of calories
    - Cholesterol < 200 mg/day
    - Limited trans-fats
    - Consider increased viscous (soluble) fiber (10-25 g/day) and plant stanols/sterols
      - (2 g/day)
  - 2. Increase Physical Activity
- **Pharmacological Treatment**
Drug therapy

- Consider adding drug therapy if LDL exceeds levels
  - Consider drug simultaneously with lifestyle changes for CHD and CHD equivalents
  - Consider adding drug to lifestyle changes after 3 months for other risk categories
Medications for Hyperlipidemia

- HMG-CoA Reductase Inhibitors (Statins)
- Bile Acid Sequestrants
- Nicotinic Acid
- Fibric Acids

- Cholesterol Absorption Inhibitors
- Omega-3 Fatty Acids
- OTC/Herbal Products
HMG CoA Reductase Inhibitors (Statins)

- First choice for LDL lowering
- High doses of Atorvastatin had proven to be beneficial in patients with Acute Myocardial Infarction and stroke
- Mechanism of action
  - ↑ LDL catabolism
  - Inhibit LDL synthesis
## HMG-CoA Reductase Inhibitors (Statins)

<table>
<thead>
<tr>
<th></th>
<th>Dosage</th>
<th>Administration</th>
<th>Metabolism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atorvastatin</strong></td>
<td>10-80mg</td>
<td>Bedtime</td>
<td>Hepatic CYP P450 3A4</td>
</tr>
<tr>
<td><strong>Fluvastatin</strong></td>
<td>20-80mg</td>
<td>Bedtime</td>
<td>Hepatic CYP P450 2C9</td>
</tr>
<tr>
<td><strong>Lovastatin</strong></td>
<td>10-80mg</td>
<td>Evening meal</td>
<td>Hepatic CYP P450 3A4</td>
</tr>
<tr>
<td><strong>Pitavastatin</strong> (New)</td>
<td>2-4mg</td>
<td>Any time</td>
<td>Minimal Hepatic CYP P450 2C9</td>
</tr>
<tr>
<td><strong>Pravastatin</strong>  (JHS Formulary)</td>
<td>10-80mg</td>
<td>Bedtime</td>
<td>Sulfation</td>
</tr>
<tr>
<td><strong>Rosuvastatin</strong>  (New)</td>
<td>5-40mg</td>
<td>Bedtime</td>
<td>Hepatic CYP P450 2C9/2C19</td>
</tr>
<tr>
<td><strong>Simvastatin</strong></td>
<td>5-80mg</td>
<td>Bedtime</td>
<td>Hepatic CYP P450 3A4</td>
</tr>
</tbody>
</table>
Statins
Contraindications/Adverse Effects

• Contraindicated in active or chronic liver disease

• Most important adverse effects
  – Myopathy or muscle pain
  – Rhabdomyolysis - can lead to renal failure
  – Hepatotoxicity (↑ liver enzymes)

• New FDA 2011 Safety Alert with Simvastatin 80 mg dose and increase risk of muscle injury
Statins Drug-Drug Interactions

- ↑ Effect/toxicity of levothyroxine and digoxin
- Niacin and fibrates can ↑ risk of myopathy and rhabdomyolysis
- Cholestyramine may decrease absorption
  - Administer 1 hour before or 4 hours after
- Warfarin- ↑ INR
Caution or Avoid Use of Potent Inhibitors of CYP P450 3A4

- Azole antifungals (e.g., ketoconazole, itraconazole, voriconazole, fluconazole)
- Macrolide antibiotics (e.g., erythromycin, clarithromycin)
- HIV protease inhibitors (e.g., indanavir, saquinavir, nelfinavir)
- Nefazodone, amiodarone, cyclosporin
- Grapefruit juice (> 1 quart/day)
Effect on lipid profile

- ↓ LDL- 18-55%
- ↓ Triglycerides (TG)- 7-30%
- ↑ HDL- 5-15%
## Statin Equivalent Doses

<table>
<thead>
<tr>
<th>Rosuvastatin (Crestor) (JHS Form.)</th>
<th>Atorvastatin (Lipitor)</th>
<th>Fluvastatin (Lescol)</th>
<th>Lovastatin (Mevacor) (JHS Form.)</th>
<th>Pravastatin (Pravachol) (JHS Form.)</th>
<th>Simvastatin (Zocor)</th>
<th>Pitavastatin</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mg</td>
<td>-----</td>
<td>40 mg</td>
<td>20 mg</td>
<td>20 mg</td>
<td>10 mg</td>
<td>1 mg</td>
</tr>
<tr>
<td>5 mg</td>
<td>10 mg</td>
<td>80 mg</td>
<td>40 mg</td>
<td>40 mg</td>
<td>20 mg</td>
<td>2 mg</td>
</tr>
<tr>
<td>10 mg</td>
<td>20 mg</td>
<td>-----</td>
<td>80 mg</td>
<td>80 mg</td>
<td>40 mg</td>
<td></td>
</tr>
<tr>
<td>20 mg*</td>
<td>40 mg</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>80 mg</td>
</tr>
<tr>
<td>40 mg*</td>
<td>80 mg</td>
<td>20 to 80 mg can be converted to 5mg of rosuvastatin</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>4 mg</td>
</tr>
</tbody>
</table>

*Normal renal function is required*
Bile Acid Sequestrants

- Not routinely used due to unwanted GI effects (constipation, GI distress)
- Decreased absorption of other drugs
  - Administer 2 hours before or 4 hours after the drug
- Mechanism of Action
  - Increases breakdown of LDL, decreases cholesterol absorption
- Can increase TG levels
- Contraindicated in biliary obstruction
Bile Acid Sequestrants
Available Products

- Cholestyramine (Questran)
  - 4-16 gm/day
- Colestipol (Colestid)
  - 5-30 gm/day
- Colesevelam (Welchol)
  - 3 tabs BID with meals or 6 tabs once a day
Effect on Lipid Profile

- ↓ LDL - 15-30%
- TG - no change or ↑
- ↑ HDL - 3-5%
Nicotinic Acid

- Best agent to increase HDL
- One study showed that can slow plaque build-up
- AIM-HIGH trial-stopped prematurely
  - Niaspan® in combination with statin therapy in pts with history of CV disease showed no additional benefit and a trend of increase risk of stroke
- Mechanism of action
  - Decreases LDL & VLDL creation, decreases breakdown of HDL
- Contraindications
  - Absolute: chronic liver disease, severe gout
  - Relative: diabetes, peptic ulcer disease, hyperuricemia
Nicotinic Acid Available Products

• Immediate release (various)
  – Higher incidence of flushing
  – 1.5-3 gm/day

• Sustained release
  – Higher incidence of hepatotoxicity
  – 1-2 gm/day

• Extended release (Niaspan)
  – Most commonly prescribed
  – Less incidence of flushing and hepatotoxicity
  – 500mg at bedtime x 4 weeks and can be increased to a maximum of 2 gm/day
Nicotinic Acid Adverse Effects

- Flushing
  - Administer aspirin or NSAIDS 30 min. before
- Hyperglycemia
- Hyperuricemia
- Upper GI distress
- Hepatotoxicity
Effect on Lipid Profile

- ↓ LDL - 5-25%
- ↓ TG - 20-50%
- ↑ HDL - 15-35%
Fibric Acid Derivatives

- Useful in treating the metabolic syndrome associated with high TG and low HDL
- Studies have demonstrated that fibrate therapy reduces CHD morbidity and mortality
- Mechanism of action
  - Decreases VLDL creation, increases removal of TG-rich lipoproteins from fat
- Contraindications
  - Severe renal disease
  - Severe hepatic disease
  - Pre-existing gallbladder disease
Fibric Acids Available Products

- Gemfibrozil (Lopid)
  - 600 mg BID
- Fenofibrate (Tricor)
  - 48-145 mg once daily
- Fenofibric Acid (Trilipix)
  - Delayed Release Caps
  - 45-135 mg once daily
  - Less incidence of rhabdomyolysis than gemfibrozil
Fibric Acids Adverse Effects

- GI effects (dyspepsia, abdominal pain, nausea, diarrhea)
- Gallstones
- Myopathy
- Rhabdomyolysis - higher incidence when given in combination with a statin
Effect on Lipid Profile

- ↓ LDL: 5-20%
- ↓ TG: 20-50%
- ↑ HDL: 10-20%
Cholesterol Absorption Blockers

- **Mechanism of Action**
  - Inhibits absorption of cholesterol at the brush border of the small intestine to reduce LDL cholesterol

- **Adverse Effects**
  - GI effects, headache, slight increase in liver enzymes when it is used in combination with statins

- **Effect on lipid profile**
  - ↓ LDL- 17%
  - ↓ TG- 12-34%
  - ↑ HDL- 8-10%
Cholesterol Absorption Blockers
Available Products

- Ezetimibe (Zetia)
  - 10 mg once a day
  - Not first line agent
  - Studies have not shown any benefit with or over statin therapy in terms of cardiovascular benefit or regression of plaque build-up
Natural Products

- Plant Stanols/Sterols (margarine spreads, yogurts)
- Soluble fibers (oats, flaxseeds, beans)
- Garlic
- Red Yeast Rice
Natural Products (continued)

- Fish Oil- Omega-3 fatty acids-lower TG levels
  - Salmon, tuna, etc.
  - Medications:
    - Lovaza® – needs prescription
    - 4 gm per day
    - (4 caps once daily or 2 caps BID)
Treatment According to Lipoprotein Abnormality

- High LDL
  - Statins (1ST Choice)
  - Nicotinic Acid
  - Fibrates

- Low HDL
  - Nicotinic Acid
  - Fibrates

- High TG
  - Fibrates
  - Nicotinic Acid
  - Omega-3 Fatty Acids
Combination Therapy

- No adequate response on a single agent
- Combined dyslipidemia
- Assess patient risk for adverse effects
  - Age
  - Renal and/or liver failure
  - Drug-drug interactions
  - Follow-up

- Most common combination therapy:
  - Statin + Fibrates
  - Statin + Nicotinic Acid
  - Statin + Omega-3 fatty acids
Special Populations

- Diabetes
- HIV patients
- Elderly
- Stroke patients
  - SPARCL trial
Conclusions

- Dyslipidemia is a major risk factor for CAD and stroke, with CAD been the leading cause of death in the U.S.
- The latest ATP III guidelines update reinforce the importance of aggressive treatment to achieve cholesterol goals especially in the high risk population to reduce CAD mortality.
- Health care professionals play an important role in managing dyslipidemia by educating patients about the disease process and therapy options.
References

- Grundy SM; Cleeman JI; Bairey NB; et.al. Implications of recent clinical trials for the national cholesterol education program adult treatment panel III guidelines. Circulation 2004; 110:227-239.
Corey Frederick & Ashley Gustafson, Pharm.D. PGY-1
Pharmacy Residents
Jackson Memorial Hospital

JMH Stroke Education 2013