Incidence Of Hypertension

- About **70 million** American adults have high blood pressure. About 33% of the population
- Only **52%** have BP under control.
- Nearly a third of US adults have prehypertension.
- Hypertension costs **$46 billion** a year. (healthcare services, medications, missed work)

From CDC Blood Pressure Facts 2015
What is Hypertension?

- JNC 7 (1997) definitions
  
<table>
<thead>
<tr>
<th>Stages</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prehypertension</td>
<td>102-129 OR</td>
<td>80-89</td>
</tr>
<tr>
<td>High BP Stage 1</td>
<td>140-159 OR</td>
<td>90-99</td>
</tr>
<tr>
<td>High BP Stage 2</td>
<td>160 or higher OR</td>
<td>100 or higher</td>
</tr>
</tbody>
</table>

- JNC 7 Goal BP = <140/90

- JNC 8: did not define classification
  - Patients 60 and +, start Rx when BP > 150/90*
  - Patient < 60, start Rx when BP > 140/80

From National Heart, Lung Blood Institute
SPRINT Study

- NIH supported study
- 9000+ subjects
- With at least one risk factor for CV disease
- Preliminary findings---
- Adults 50 and older with HBP, targeting a SBP <120 reduced rates of CV events by 25%; reduced risk of death by 27% compared to a target of SBP 140.

National Heart, Lung and Blood Institute
Resistant hypertension is defined as blood pressure that remains above goal despite concurrent use of three antihypertensive agents of different classes, one of which should be a diuretic.

Patients whose blood pressure is controlled with four or more medications are considered to have resistant hypertension.
Complex Hypertension

- BP above goal- 140/90 most patients. 130/80 diabetics or renal disease.
- Confirmed on at least two occasions with appropriate size cuff.
- Adherence to appropriate 3 drug regimen including a diuretic.
Common Antihypertensive Meds

- Diuretics
- Angiotensin-converting enzyme (ACE) inhibitors
- Angiotensin II receptor blockers (ARBs)
- Calcium channel blockers
- Beta-blockers
JNC 8 Recommendations

- Diuretics
- Angiotensin-converting enzyme (ACE) inhibitors
- Angiotensin II receptor blockers (ARBs)
- Calcium channel blockers
JNC 8 – Black Population

- Thiazide Diuretic
- Calcium Channel Blocker
- Then ACE or ARB
Diuretics

- Thiazide diuretics are first line
- Strongly consider chlorthalidone 12.5-25 mg rather than HCTZ.

- Renal impairment?
  - Loop diuretics
Diuretics

- **Advantages**
  - Least expensive antihypertensive drugs.
  - Best drug for treatment of systolic hypertension and for hypertension in the elderly.
  - Can be combined with all other antihypertensive drugs to produce synergetic effect.

- **Mechanisms of Action**
  - Initial effects: through reduction of plasma volume and cardiac output.
  - Long term effect: through decrease in total peripheral vascular resistance.
ACE-I or ARB

- Patients with diabetes or chronic kidney disease.
- Monitor potassium
- ACE-I or ARB
- Common
  - ACE-I: enalapril, lisinopril, ramapril, quinapril ("pril" meds)
  - ARB: losartan, olmesartan, valsartan ("sartan" meds)
ACE or ARB

- Advantages
  - Reduction of cardiovascular morbidity and mortality in patients with atherosclerotic vascular disease, diabetes, and heart failure.
  - Favorable metabolic profile.
  - Improvement in glucose tolerance and insulin resistance.
  - Renal glomerular protection effect especially in diabetes mellitus.
ACE or ARB

- **Mechanisms of Action – ACE**
  - Inhibition of circulating and tissue angiotensin-converting enzyme.
  - Increased formation of bradykinin and vasodilatory prostaglandins.
  - Decreased secretion of aldosterone; help sodium excretion.

- **ARB**
  - They act by blocking type I angiotensin II receptors generally, producing more blockade of the renin-angiotensin-aldosterone axis.
Calcium Channel Blockers (CCB)

- Amlodpine
- Diltiazem
- Felodipine
- Nicardipine
- Verapamil
Advantages

- No metabolic disturbances: no change in blood glucose, potassium, uric acid and lipids.
- May improve renal function.
- Maintain optimal physical, mental, and sexual activities.
- Anti-anginal

Mechanisms of Action

- Decrease in the concentration of free intracellular calcium ions results in decreased contraction and vasodilation.
- Diuretic effect through increase in renal blood flow and glomerular filtration rate.
- Inhibition of aldosterone secretion.
Complex Hypertension Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudo hypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor compliance.
- Secondary hypertension.
- Pseudo hypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Suboptimal Therapy

- Singly most common cause
- Frequency of follow up
  - 1 month
- Maximize Current Medication vs. Start Another Medication
- Cost
- Dose frequency
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudo hypertension.
- Ingestion of substances that elevate BP
- “Obesity and metabolic syndrome.”
Extracellular Volume

- DASH Diet
- Sodium Restriction
- Diuretics
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudohypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Poor Adherence

- Develop relationship to be able to explore patient’s perceived or actual barriers.
  - Cost
  - Dosing frequency
  - Side effects
  - Cultural beliefs
  - .......
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudohypertension.
- Obstructive sleep apnea syndrome.
- Ingestion of substances that elevate BP
- “White coat hypertension”.
- Obesity and metabolic syndrome.
Secondary Hypertension

- Renal Disease
- Renal Artery Stenosis
- White-coat Hypertension
- Obstructive Sleep Apnea
- Aldosteronism
Renovascular Hypertension

- Most common correctable cause of secondary hypertension.
- Onset of hypertension below age 30 especially if negative family history or no other risk factors.
- Onset of stage II or severe hypertension – blood pressure greater than 160/100 after age 55.
- Refractory or resistant hypertension in patient adhering to therapeutic doses of 3 appropriate antihypertensive agents including a diuretic.
- Acute rise in blood pressure over previously stable baseline.
Renovascular Hypertension

- Malignant hypertension – severe hypertension and signs of end organ damage such as acute renal failure, retinal hemorrhages or papilledema, heart failure or neurological disturbance
- Acute elevation of plasma creatinine after initiation of angiotensin-converting enzyme inhibitor or angiotensin receptor blocker
- Moderate to severe hypertension in patient with unexplained atrophic kidney or asymmetry in renal sizes of greater than 1.5-cm. A unilateral small kidney – less than 9 cm and has a 75% correlation with presence of large vessel occlusive disease.
- Moderate to severe hypertension the patients with diffuse atherosclerosis especially over age 50.
Intervention

- Life style changes
- Monitor renal function
- Renal artery ultrasound
- Renal artery angiogram +/- stent.
- Renal artery denervation – on hold
White Coat Hypertension

- 20-25% of patients with office DBP of 90-104 mmHg had normal ABPM or home readings.
- Consider ambulatory BP monitoring
- Home BP monitoring and reporting.
- Cautious use of antihypertensive medications.
Obstructive Sleep Apnea

- Suspect
- Overnight oximetry
- Consult sleep specialist
- Weight loss
Primary Mineralocorticoid Excess

- Triad of hypertension, unexplained hypokalemia and metabolic alkalosis.
- Normokalemia more common.
- Also seen in renal vascular disease, diuretic therapy, Cushing’s syndrome, licorice ingestion and adrenal hyperplasia.
Primary Hyperaldosteronism

- More common than previously believed.
- Prevalence increases with increasingly severe degrees of hypertension.
- Estimated prevalence - 10% of general hypertensive population, 20% of resistant hypertension patients.
- Equally distributed between white and African American subjects.
- Most patient have bilateral adrenal hyperplasia.
Spironolactone in Resistant Hypertension

- Observational study of 133 patients with resistant HRN
- 25-50 mg daily
- 11 patients with SE
- 2 patients developed hyperkalemia
- SBP reduction 21.7 mmHg
- Blood pressure reduction similar in sub-use with and without primary aldosteronism.
- Careful monitoring of renal function and electrolytes.
- Recommend 12.5 to 25 mg daily.

Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudohypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Pseudohypertension

- Older patients have thickened, calcified arteries.
- As a result of compression or brachial artery with sphygmomanometer requires a cuff pressure greater than pressure within the artery.
- Suspect if:
  - Marked cuff hypertension in the absence of end organ damage.
  - Antihypertensive therapy induces symptoms compatible with hypotension – dizziness and weakness.
- Can be confirmed only by direct measurement of intra-arterial pressure. Blood pressure measurement via automatic oscillometric recorder or finger blood pressure recorder may provide more accurate readings.
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudohypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Interfering exogenous substances

- Amphetamines
- Anabolic Steroids
- Anti-inflammatory agents
- Appetite suppressants
- Caffeine
- Cocaine
- Corticosteroids
- Ethanol
- Licorice
- Nicotine
- Some dietary and herbal supplements
- ........
Ingestion of Substances

- Accurate medication and social history
  - To include supplements and OTC
- Assess need to continue and/or possible alternatives to interfering substance.
- Educate the patient on the interference.
Contributing Issues

- Suboptimal therapy.
- Extracellular volume expansion.
- Poor adherence.
- Secondary hypertension.
- Pseudohypertension.
- Ingestion of substances that elevate BP
- Obesity and metabolic syndrome.
Obesity

- Weight gain is associated with increases in arterial pressure.
- Estimated 60-70% of hypertension in adults is attributed to weight.
  - 7 new miles of blood vessels for each 1 pound of weight gain.
- Increased sympathetic NS activity, NA retention, RAAS activation, altered vascular function.
Resistant/Complex Hypertension is a multi-factorial problem.

Frequent follow up and relationship building

Assess adherence to treatment plan
  - Daily dosing
  - Generics
  - Combination meds when doses are stable
Take Away-Intensify Therapy

- Intensify therapy
- Increase dose of diuretic (or change HCTZ to chlorthalidone) or change to a loop diuretic for those with GFR 30 mL/min
- If no contraindications, add spironolactone as first-choice (starting at 12.5 mg daily); eplerenone (starting at 25 mg daily),
- Maximize doses of ACE/ARB and CCB
- Consider referral to hypertension specialist.
Take Away-Intensify Therapy

- Consider beta blocker therapy
  - Carvedilol or bystolic (alpha and beta blockade).
  - CAD/HF recommended
  - Caution with bradycardia

- Consider renin inhibitor
  - Aliskiren 150-300 mg daily

- Consider central alpha agonists
  - Clonidine 0.1-0.3 BID PO, patch
    - Syncope, slow weaning to DC
Take Away

- Rule out measurement error and white coat effect
  - Correct size cuff, repeat measurement
  - Out of office monitoring, ABP monitor, home assessment

- Associated co-morbidities

- Consider secondary causes

- Volume overload
  - Lower sodium intake
  - Utilize chlorthaladone
Take Away

- Interfering substances
  - Know what the patient is taking
  - Patient education
  - Reduce ETOH

- Obesity/ OSA
  - Weight loss
  - Sleep evaluation
F/U visit: 76 year old, sedentary, white female.
BP 160/90 both arms sitting. Confirmed.
Meds- olmesartan 20 mg qd, amlodipine 10 mg qd, atenolol 50 mg qd.
Aleve for arthritis.
Weight-200lb.
Exam-Apex diffuse and displaced, S4 at apex, 1-2+ edema.
Thank you!

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