Hypertension

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Proper Technique for Measurement of Blood Pressure

Patient Conditions:
- no caffeine during preceding hour, no smoking for 30 minutes prior to readings
- comfortable, warm surroundings
- pt sitting with feet on ground (or supported)
- arm is supported at the level of the heart

Proper Technique for Measurement of Blood Pressure

Equipment:
- Cuff size: the cuff should cover at least 1/2 of the length of the arm and completely surround the arm
- The bladder should be positioned over the brachial artery
- Manometers should be calibrated every 6 months against a mercury manometer

Proper Technique for Measurement of Blood Pressure

Take at least 2 readings each visit, separated by as much time as possible, if readings vary by more than 5 mm Hg, take additional readings until two consecutive readings are close
- Inflate the bladder to 20 mm Hg above the systolic blood pressure as estimated by the radial pulse

Proper Technique for Measurement of Blood Pressure

- Deflate the bladder at a rate of 3 mm Hg per second
- Note the position of the patient, which arm and the cuff size used
- For the diagnosis of hypertension, take three readings at least one week apart (except for severe hypertension)
- Take BP in both arms initially, then in the future always use the arm with the higher reading

Hypertension: The Problem

- 60 million Americans have high blood pressure
- Virginia has the 7th highest stroke rate in the US
- The prevalence of hypertension in Black males in our region is about 35%, many are not aware of their diagnosis
- Most patients with hypertension have additional risk factors for cardiovascular disease and thus early intervention is crucial
Hypertension: Epidemiology

National Health & Nutrition Examination Survey

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<tbody>
<tr>
<td>Awareness</td>
<td>51</td>
<td>73</td>
<td>68</td>
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<tr>
<td>Treatment</td>
<td>31</td>
<td>55</td>
<td>54</td>
<td>59</td>
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<tr>
<td>Control</td>
<td>10</td>
<td>29</td>
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Classification of Blood Pressure for Adults Aged 18 years and older

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic And/Or</th>
<th>Diastolic</th>
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<tbody>
<tr>
<td>Normal</td>
<td>&lt;120 and</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139 or</td>
<td>80-89</td>
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<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>140-159 or</td>
<td>90-99</td>
</tr>
<tr>
<td>Stage 2</td>
<td>&gt;160 or</td>
<td>&gt;100</td>
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Evaluation of Hypertension

- **Purpose:**
  - Assess end organ damage
  - Assess cardiovascular risk
  - r/o secondary causes of hypertension

Evaluation of Hypertension: The History

- **Duration of hypertension**
- **Prior treatment, if any (including assessment of any side effects from medications resulting in discontinuation)**
- **Assess ingestion of substances known to influence blood pressure: e.g. Estrogens, adrenal steroids, sympathomimetics, excess sodium**

Evaluation of Hypertension: The History - 2

- **Family history:** hypertension, premature cardiovascular disease, familial diseases, renal disease, diabetes
- **Symptoms of secondary hypertension:** muscle weakness, spells of tachycardia, sweating, tremor, thinning of the skin, flank pain

Evaluation of Hypertension: The History - 3

- **Symptoms of End-Organ Damage:** headaches, transient or permanent weakness or blindness, loss of visual acuity, chest pain, dyspnea, claudication
- **Presence of other risk factors:** smoking, diabetes, hyperlipidemia, physical inactivity, obesity
Evaluation of Hypertension: The History - 4
- Dietary history: sodium, alcohol, saturated fats
- Psychological factors: family structure, work status, educational level
- Sexual function

Evaluation of Hypertension: The Physical Exam - 2
- Extremities: palpate peripheral pulses, assess for edema
- Neurologic Assessment: evidence of CVA

Evaluation of Hypertension: The Physical Exam
- Fundoscopy
- Neck: palpation and auscultation of the carotid pulses, thyroid palpation
- Heart: size, rhythm, sounds
- Lungs: listen for rales
- Abdomen: assess for renal masses, bruits over aorta or renal arteries

Evaluation of Hypertension: Laboratory Testing
- CBC
- Chem 7
- Urinalysis
- Lipid Profile

Evaluation of Hypertension: The Electrocardiogram
- Diagnosis of LVH made by:
  - R wave in I + S wave in lead III > 25mm
  - R wave in aVL>11 mm
  - R wave in aVF>20 mm
  - S wave in aVR>14 mm
  - R wave in V5 or V6>25 mm
  - R wave in V5 or V6 + S wave in V1>35 mm
  - Largest R wave + largest S wave in precordial leads > 45

Retinal Disease In Hypertension
- Arteriolar Thickening
  - Grades I & II: enhanced prominence of light reflex, vascular tortuosity, A-V nicking
  - Grades III & IV: copper wire, then silver wire changes of arterioles
Retinal Disease In Hypertension

Hypertensive Retinopathy
- Grades I & II: focal then generalized arteriolar constriction representing the autoregulatory response to increased blood pressure
- Grades III: flame shaped hemorrhages, fluffy, white cotton wool spots, yellow white exudates

Grade IV Hypertensive Retinopathy
- Hemorrhages and exudates
- Papilledema (blurring of disk margins)

Left Ventricular Hypertrophy
Secondary Hypertension

Etiology
- Renal Artery Stenosis
- Hyperaldosteronism or Glucocorticoid Responsive Hypertension
- Cushing’s Syndrome
- Hypothyroidism
- Coarctation of the Aorta

Etiologies Continued
- Renal Parenchymal Disease
- Pheochromocytoma
- Oral Contraceptives

Renal Artery Stenosis
- New onset hypertension <20 or >50 y.o.
- No family history of hypertension
- Severe or refractory hypertension
- Asymmetric renal size (Sono, IVP or CT)
- Abdominal Bruit (esp. if diastolic)
- Acute rise in Serum creatinine post starting ACE inhibitor

Secondary Hypertension: Renovascular Disease

Screening Tests
- “Hypertensive Urogram”
- Renal artery ultrasound
- Captopril Renal Scan
- Magnetic Resonance Angiography
- Spiral CT
- Angiogram

Secondary Hypertension: Renovascular Disease

Captopril Renal Scan
- DTPA Nuclear Medicine scan post administration of Captopril 25 mg po
- Criteria for “positive” test:
  - Decrease relative uptake of one kidney in which that kidney accounts for ≤ 40% GFR
  - Delayed uptake by both kidneys that is improved on a “resting” scan
Secondary Hypertension: Primary Renal Disease

- Screening/Detection:
  - Abnormal Urinalysis
  - Elevated serum creatinine
  - Renal Ultrasound

Secondary Hypertension: Primary Renal Disease

- Mechanisms of Hypertension in Renal Parenchymal Disease:
  - Activation of RAAS
  - Increased Sodium & Water Retention
  - Activation of the Sympathetic Nervous System
  - ? Secondary Hyperparathyroidism

Secondary Hypertension: Oral Contraceptives

- 2-5% of women on oral contraceptives develop hypertension
  - It is thought that these women are susceptible to hypertension genetically
  - Mechanisms not well understood?
  - Increase renin substrate
  - Stopping therapy should return BP to normal in 2-3 months

Secondary Hypertension: Pheochromocytoma

- Paroxysmal elevations of blood pressure
- Triad of symptoms:
  - Headache
  - Palpitations
  - Sweating
  - Weight Loss

Secondary Hypertension: Pheochromocytoma

- Unexplained hypokalemia with accompanying renal potassium wasting
- Metabolic Alkalosis
Secondary Hypertension: Coarctation of the aorta
- Usually picked up by the pediatrician/family practitioner
- 3-5% of all congenital heart disease
- More common in males
- Differential blood pressures and pulses between the upper and lower extremities is the hallmark of the disorder

Secondary Hypertension: Sleep Apnea
- Obesity is a common denominator in many patients with Sleep Apnea Syndrome and Hypertension
- Even if correct for BMI, blood pressure is higher in apneic patients
- Treatment of sleep apnea will alleviate the hypertension in many but not all patients

Secondary Hypertension: Sleep Apnea

Hypertension: Therapy
- Why Treat?
  - Hypertension increases risk for cardiovascular disease, stroke, blindness, renal disease
  - Studies indicate that control of BP reduces risk of MI or stroke
Antihypertensive Treatment

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<tr>
<th>BP Classification</th>
<th>Lifestyle Modification</th>
<th>Initial Drug Therapy</th>
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<tr>
<td>Normal</td>
<td>Encourage</td>
<td>No Anihypertensive Drug Indicated</td>
</tr>
<tr>
<td>Prehypertensive</td>
<td>Yes</td>
<td>No Anihypertensive Drug Indicated</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Yes</td>
<td>Diuretics, consider ACEi, ARB, BB, CCB or combo</td>
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<tr>
<td>Stage 2</td>
<td>YES</td>
<td>Two drugs: Thiazide &amp; ACEi or ARB or BB or CCB</td>
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Drug Guidelines for “Compelling Indications”

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<thead>
<tr>
<th>Compelling Indication</th>
<th>D</th>
<th>BB</th>
<th>ACEi</th>
<th>ARB</th>
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Hypertension: Therapy

Nonpharmacologic Treatments
- Weight reducing diet
- Exercise
- Stop smoking
- Limit caffeine
- Low sodium diet
- “Stress” reduction

Thiazide Diuretics
- Still recommended as initial treatment of hypertension
- Particularly useful in AA males
- Use low dose (12.5 - 25mg)
- Cheap (about $4.00/month)
- Disadvantages: hypokalemia, altered glucose metabolism (increases insulin resistance), increase lipids (and decrease HDL), increase uric acid, sexual dysfunction

Beta Blockers
- Very effective
- Older preparations are inexpensive
- Especially useful to decrease reflex tachycardia seem from other antihypertensives
- Preferred drug in patients with migraines, h/o recent MI, angina, glaucoma

Disadvantages:
- Fatigue
- Weakness
- Impotence
- Increase insulin resistance
- Decrease HDL, increases LDL & triglycerides
- Withdrawal syndrome
Hypertension: Therapy

ACE Inhibitors

- Major advantage in patients with CRF, DM, CHF
- Few side effects
- Many can be given once or twice daily
- Higher doses may be required for AA pts
- Disadvantages: cough, angioedema, contraindicated in pts with bilateral renal artery stenosis

ANG II Receptor Inhibitors

- No cough or angioedema, so better tolerated than ACE inhibitors
- Disadvantage: No experience with long-term benefits

Calcium Channel Blockers

- 3 classes: dihydropyridines (e.g. nifedipine)
  --verapamil
  -diltiazem
- Very effective as monotherapy in AA
- Hypotensive effect partially attenuated by RAA and sympathetic nervous system (esp. dihydropyridines)

Alpha -1 Blockers

- Modest antihypertensive effect
- Good drug in older men with prostatic hypertrophy
- Disadvantages: fatigue, drowsiness, dizziness

Central Sympathetic Blockers

- E.g. Clonidine, methyldopa, guanabenz, guanfacine
- Do not effect lipid metabolism
- Methyldopa has the best track-record for pregnant women
- Most cause severe withdrawal hypertension

Vasodilators

- E.g. Minoxidil, hydralazine
- Excellent antihypertensive agents
- Disadvantages: fluid retention, minoxidil causes hair growth and hydralazine has been shown to cause drug-induced lupus in some patients
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