Evaluation and Treatment of Elevated Blood Pressure: A Comprehensive Approach

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Disclosure

• I have no disclosures for this talk
Learning Objectives

• Define elevated blood pressure
• Understand underlying causes for elevated blood pressure
• Know modifiable causes for elevated blood pressure
• List first line treatment for elevated blood pressure
• Identify special populations and approach to elevated blood pressure
• Understand the role of diet and exercise
Definitions

- Normotensive- SBP <120; DPB <80
- Pre-hypertensive- SBP 120-139; DBP 80-139
- Stage 1 hypertension- SBP 140-159; DBP 90-99
- Stage 2 hypertension- SBP ≥ 160; DBP ≥ 100

- SBP=Systolic Blood Pressure
- DBP=Diastolic Blood Pressure
Technique for Measuring Blood Pressure

• Prepare the patient:
  – Make sure the patient is relaxed by allowing 5 minutes to relax before the first reading.
  – The patient should sit upright with their upper arm positioned so it is level with their heart and feet flat on the floor.
  – Remove excess clothing that might interfere with the BP cuff or constrict blood flow in the arm.
  – Be sure you and the patient refrain from talking during the reading.
Technique for Measuring Blood Pressure

• The Cuff

YOU MUST CHOOSE

BUT CHOOSE WISELY
Technique for Measuring Blood Pressure

• The Cuff
  – The size of the BP cuff will affect the accuracy of these readings.
  – The inflatable bladder, which can be felt through the vinyl covering of the cuff, should reach roughly 80% around the circumference of the arm while its width should cover roughly 40%.
  – If it is too small, the readings will be artificially elevated.
  – The opposite occurs if the cuff is too large.
  – Clinics should have at least 2 cuff sizes available, normal and large.
  – Try to use the one that is most appropriate, recognizing that there will rarely be a perfect fit.
Technique for Measuring Blood Pressure
Technique for Measuring Blood Pressure

Length of Blood Pressure Cuff
Technique for Measuring Blood Pressure

- **Place the BP cuff on the patient's arm:** Palpate/locate the brachial artery and position the BP cuff so that the ARTERY marker points to the brachial artery. Wrap the BP cuff snugly around the arm.

- **Position the stethoscope:** On the same arm that you placed the BP cuff, palpate the arm at the antecubical fossa (crease of the arm) to locate the strongest pulse sounds and place the bell of the stethoscope over the brachial artery at this location.
• **Inflate the BP cuff:** Begin pumping the cuff bulb as you listen to the pulse sounds. When the BP cuff has inflated enough to stop blood flow you should hear no sounds through the stethoscope. The gauge should read 30 to 40 mmHg above the person's normal BP reading. If this value is unknown you can inflate the cuff to 160 - 180 mmHg. (If pulse sounds are heard right away, inflate to a higher pressure.)
Technique for Measuring Blood Pressure

- **Slowly Deflate the BP cuff:** Begin deflation. The AHA recommends that the pressure should fall at 2 - 3 mmHg per second, anything faster may likely result in an inaccurate measurement.

- **Listen for the Systolic Reading:** The first occurrence of rhythmic sounds heard as blood begins to flow through the artery is the patient's systolic pressure. This may resemble a tapping noise at first.

- **Listen for the Diastolic Reading:** Continue to listen as the BP cuff pressure drops and the sounds fade. Note the gauge reading when the rhythmic sounds stop. This will be the diastolic reading.
Office vs Ambulatory monitoring

- Moment in time
- Variation throughout the day
- Cost of equipment
- Reimbursement
- Wear and tear
- Acceptance
SPRINT

• At each visit, patients were seated in a quiet area for 5 minutes
• Then, BP was recorded by a commercially available automated unit that recorded three readings, separated by several minutes, with no clinician in the room.
• Decisions were based on the average of the three readings.
• Other studies have shown this method of BP measurements yields substantially lower readings than does the single rushed measurement typical in most practices.
Who do we screen?

- The U.S. Preventive Services Task Force strongly recommends screening all adults older than 18 years for hypertension.
- One rationale for screening for hypertension in children and adolescents is that early identification of primary hypertension could lead to interventions to reduce blood pressure during childhood and adolescence, resulting in a reduced risk of cardiovascular events and death in adulthood.
Prevalence

• The prevalence of hypertension in children and adolescents in the United States has been reported at 1% to 5%.
• The prevalence of hypertension among obese children in the United States is estimated at 11%.
• Primary hypertension in children and adolescents is associated with several risk factors, the strongest of which is elevated body mass index.
• The prevalence of hypertension in children and adolescents has increased over the past several decades, which is probably attributable to the increase in the prevalence of childhood overweight and obesity.
So Why Do We Care

- Measures of blood pressures in late adolescence were found correlating SBP with coronary heart disease and AMI, DBP with coronary heart disease, AMI and stroke.
- It is the time in their lives when we can make impact and long-term change?
Primary vs Secondary Hypertension

• Primary or Essential Hypertension-Hypertension with no known cause; accounts for between 90 and 95% of patients diagnosed with hypertension.

• Secondary Hypertension-elevated blood pressure associated with any of several primary diseases, such as renal, pulmonary, endocrine, and vascular diseases.
Patient History

- Past medical history
- Alcohol use
- Drug use
- Medications
Patient History

• Medications:
  – Alcohol, amphetamines, ecstasy (MDMA and derivatives), and cocaine
  – Antidepressants (including venlafaxine, bupropion, and desipramine)
  – Caffeine (including the caffeine in coffee and energy drinks)
Patient History

- Medications:
  - Corticosteroid
  - Cyclosporine, Tacrolimus
  - Erythropoietin
  - Estrogens (including birth control pills) and other hormones
  - Testosterone
  - Many over-the-counter medications such as cough/cold and asthma medications -- particularly when the cough/cold medicine is taken with certain antidepressants like tranylcypromine (MAO-I) or tricyclics
Patient History

- Medications:
  - Migraine medications
  - Nasal decongestants
  - Nonsteroidal anti-inflammatory drugs (NSAIDs)
Family History

- Hypertension
- Stroke
- Coronary artery disease
- Depression
- Drug or Alcohol abuse
Social History

- Smoking
- Alcohol use
- Exercise
- Diet
- Illicit drug use
Review of systems

- Vision
- Neurologic
- Endocrine
- Cardiac
- Pulmonary
- Gastrointestinal
- Dermatologic
- Urologic
- Psychologic
Physical exam

- Vitals
- Skin
- HEENT
- Cardiovascular
- Pulmonary
- Abdomen
- Genitourinary
- Extremities
- Nervous system
Laboratory Work-up

• Targeted labs based of physical exam and history
  – Minimum
    • CBC
    • U/A
    • BMP
    • Targeted secondary causes if indicated
Other testing

• ECG
• CXR
• Echocardiogram
• Renal U/S
Interventions

• Stage 1 hypertension in children is treated with lifestyle and pharmacologic interventions.
• Medications are not recommended as first-line therapy.
• Lifestyle interventions for hypertension include weight reduction in children who are overweight or obese, increased physical activity, and restricted sodium intake, as well as education and counseling.
Interventions

• The NHBPEP recommends medication for children with stage 2 hypertension or for hypertension that is unresponsive to lifestyle modification.
• Many medications have been approved by the U.S. Food and Drug Administration for the treatment of hypertension in children, including diuretics, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, beta blockers, and vasodilators.
<table>
<thead>
<tr>
<th>Risk Factors Non-modifiable</th>
<th>Risk Factors Modifiable</th>
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<tbody>
<tr>
<td>• Sex</td>
<td>• Diet especially Na &amp; K</td>
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<td>• Family History</td>
<td>• Activity</td>
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<td>• Race/ Ethnicity</td>
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<td>• Other</td>
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Prevention

- Healthy Diet
  - DASH diet
  - Consume a diet that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, and nuts; and limits intake of sweets, sugar sweetened beverages, and red meat. Adapt this dietary pattern to appropriate caloric requirements, personal and cultural food preferences, and nutritional therapy for other medical conditions (including diabetes mellitus).
Prevention

- Healthy Diet
  - DASH diet
  - Consume no more than 2,400 mg of sodium per day.
  - Further reduction of sodium intake to 1,500 mg per day is associated with even greater reduction in blood pressure.
  - Reducing intake by at least 1,000 mg per day will lower blood pressure even if the desired daily intake is not achieved.
  - Combine the DASH diet with lower sodium intake.
Prevention

- Weight loss of approximately 9 lb (4 kg) is associated with a modest reduction in SBP and DBP, but the effects on mortality are unknown.
- Regular aerobic exercise decreases SBP and DBP in patients with hypertension.
  - In general, advise adults to engage in aerobic physical activity to lower blood pressure (three or four 40-minute sessions of moderate to vigorous activity per week).
- Tobacco use is associated with an acute increase in blood pressure, and tobacco cessation is associated with reduced rates of stroke and myocardial infarction.
Prevention

• Regular consumption of alcoholic drinks increases blood pressure in patients with hypertension.
• Reducing alcohol consumption to no more than two drinks per day in men and no more than one drink per day in women improves blood pressure, but the effect on cardiovascular end points is unknown.
Prevention
What does it do?

• Dash Diet plus sodium restriction
  – SBP reduction 11.5 mmHg
  – DBP reduction 5.7 mmHg
• Sodium Restriction to less than 1500mg per day
  – SBP reduction 7 mmHg
  – DBP reduction 3 mmHg
• DASH diet
  – SBP reduction 5 to 6 mmHg
  – DBP reduction 3 mmHg
Prevention
What does it do?

- Weight loss of approximately 9lbs/4kg
  - SBP reduction 4.5 mmHg
  - DBP reduction 3.2 mmHg
- Exercise
  - SBP reduction 4 mmHg
  - DBP reduction 3 mmHg
- Restriction of alcohol consumption
  - SBP reduction 3 mmHg
  - DBP reduction 2 mmHg
Special Populations

• Transgender
• African American
• Chronic Medical conditions – Rheumatologic diseases, Colitis, renal disease, diabetes, Heart disease
• International students
Special Populations

- Transgender
  - Transwomen planning to start feminizing hormones within 1-3 years: try to bring SBP to ≤ 130 and DBP to ≤ 90
  - Transwomen currently taking estrogen: monitor BP every 1-3 months: goal SBP ≤ 130 and DBP ≤ 90, consider using spironolactone as part of antihypertensive regimen
Special Populations

• Transgender
  – Transmen planning to start masculinizing hormones within 1-3 years: try to bring SBP to ≤ 130 and DBP to ≤ 90
  – Transmen currently taking testosterone: monitor BP every 1-3 months: goal SBP ≤ 130 and DBP ≤ 90, avoid using spironolactone as part of antihypertensive regimen
Special Populations

• African American
  – Life expectancy is 5.4 years shorter than Caucasians, and hypertension is the single largest contributor to this discrepancy
  – Consider life style modifications for SBP>115 and DBP>75
  – Usually require combination therapy
  – As a population they are less likely to have adequate control
  – Thiazide diuretic or calcium channel blocker as first line drug option
  – Second drug frequently needed would include renin angiotensin system blockade
Special Populations

- Chronic Medical conditions – Rheumatologic diseases, Colitis, renal disease, Diabetes, heart disease
  - Medications like disease modifying drugs may elevate blood pressure
  - Tight control of blood pressure is important in above diseases
Special Populations

• International students
  – Modifiable risk factors like smoking and diet are important to address
  – Medications from country of origin may be unavailable in the United States
Healthy HENS Program

- Student Health Service based program with an Advanced Practice Nurse, Grad Assistant and 2-3 BHAN Interns
- APN meets with student in office and checks blood pressure, cholesterol, blood sugar and does completes a health survey
- Discusses areas of concern, discusses sleep, exercise and nutrition
- Also consults with staff Nutritionist to review current diet and healthy changes including DASH
- Student will have 3 visits over 6 weeks and if Blood pressure continues to be elevated despite interventions then referral back to their SHS PCP
Case study #1

- RD is a 22 yo white male
- Seen since 9/2011 and was normotensive
- 9/2013 presents with Neck pain BP is 135/90
- PMHx: Asthma, Hypothyroid
- Family Hx: Father with HTN, Paternal Grandfather MI
- Social Hx: non-smoker, occasional alcohol use
- Medications: Fluticasone and salmeterol inhaler, Montelukast, Loratadine, Albuterol MDI, Guaifenesin and Pseudoephedrine combination tablet, Levothyroxine, mometasone furoate nasal spray, naproxen sodium
Case study #1

- 11/7/13 presents with epigastric discomfort BP 146/95
- 11/14/13 BP recheck 136/91 repeat 143/95
- 11/15/13 BP 135/95 referred to Healthy HENS program
- Lost to follow up
- 3/14/14 abdominal pain BP 146/90
- 4/23/14 BP check 140/79 repeat 139/88 again referred to Healthy HENS program
Case study #1

• Keeps appointment BMI 24.4, BP 138/90 repeat 140/90
• Diet review shows high use of cold cuts and occasional alcohol use 6 hours of sleep per night
• Discussed some dietary changes given referral to Nutritionist same day reviewed DASH diet
• f/u 1 week
• BP 118/78 eliminated processed meats and increase fruit intake
Case study #1

- 5/16/14 follow up BP 126/80 feels well, watching sodium intake
- Sleeping 7.5 hrs per night exercising 4 times per week
- 5/29/14 BP 126/80
- 11/4/14 returns for visit for back pain BP 140/94 repeat 138/92 he reports he is not exercising and has not been watching his diet
- Referred back to Healthy HENS
- 11/12/14 BP 132/78 repeat 128/72
- 11/21/14 BP 120/70
- 12/5/15 BP 120/72
Case study #1

- 1/13/15 BP 124/70
- 3/10/15 BP 118/68 exercises daily has excel spreadsheet for Na intake
- 4/24/15 BP 124/74
Case study #2

- MZ is a 33 y.o asian male
- BMI 23.5
- PMHx: Elevated LFTs, Hematuria, Renal Calculi
- PSHx: Lithrotripsy
- Family Hx: HTN-father
- Social Hx; rare ETOH, Former smoker ½ PPD x 10 years, denies illicit drug use
- Medications: none
Case study #2

- 5/23/13 presents with allergies BP 132/95
- 12/6/14 presents with rash BP 146/86
- 12/8/14 BP check 140/93 referred to Healthy HENS
- 12/9/14 Healthy Hens initial visit BP:135/90
  - Eats a lot of salty foods, 5 pots of tea a day, breakfast coffee or tea; lunch & dinner rice/vegetables/meat/tea
  - Exercises 2 hrs/week cardio & basketball, sleeps 6 hours per night
Case study #2

- 12/16/14 BP: 122/90 fasting 10 hrs per day, eliminated tea and reduced Na intake, nutrition referral
- 1/9/15 BP 130/90 sleeping 8 hrs per night, saw nutritionist- eating breakfast now, increased physical activity, dines out on chinese food 3x/week, reviewed DASH diet, decrease eating out to 1x/week, reduced Na soy sauce, reduce fried foods
- 1/30/15 weightlifting 3x/week, basketball 2-3x/week, increased fruits and vegetables in diet, dining out less often; BP 120/90
Case study #2

- 2/6/15 BP: 124/72
- 2/20/15 BP: 138/90 increase stress with new semester and baby on the way
- 3/13/15 BP: 136/92
- 3/27/15 sees PCP BP: 140/96 discuss home monitoring
- 4/10/15 BP: 130/76
- 4/17/15 BP: 130/80
- 4/24/15 Healthy HENS visit to review home monitoring SBP range 132-153; DBP range 84-96
Questions?
Thank you

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