MANAGEMENT OF HYPERTENSIVE URGENCIES AND HYPERTENSIVE CRISIS

Jason Klein DO
Cleveland academy of osteopathic Medicine’s 50th annual january seminar
January 23. 2015
Hypertension

Hypertension

high blood pressure

heart risk factors may contribute to high blood pressure

Medications low may cause one common syndrome

Hormone take able

Get site know

Common take able

Prehypertension take able
EPIDEMIOLOGY

- Most common reason for office visits of adults in the US
- In 2008 it was estimated that 30% of all adults in the US were affected
  - Fewer than 50% undergoing appropriate treatment
- Uncontrolled hypertension is one of the most important cardiovascular risk factors in the world today, and contributes to increased risk of stroke, MI, heart failure, and renal failure.
- About 60-65 million HTN adults exist in the US today and is likely to continue to increase
  - >50% adults aged 60-69 are affected
  - >75% adults aged 70 years are affected
# Blood Pressure Classification by JNC

<table>
<thead>
<tr>
<th>JNC 6 Category</th>
<th>SBP/DBP</th>
<th>JNC 7 Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIMAL</td>
<td>&lt;120/80</td>
<td>NORMAL</td>
</tr>
<tr>
<td>NORMAL</td>
<td>120-129/80-84</td>
<td>PREHYPERTENSION</td>
</tr>
<tr>
<td>BORDERLINE</td>
<td>130-139/85-89</td>
<td>PREHYPERTENSION</td>
</tr>
<tr>
<td>HYPERTENSION</td>
<td>&gt;140/90</td>
<td>HYPERTENSION</td>
</tr>
<tr>
<td>Stage 1</td>
<td>140-149/90-99</td>
<td>Stage 1</td>
</tr>
<tr>
<td>Stage 2</td>
<td>160-179/100-109</td>
<td>Stage 2</td>
</tr>
<tr>
<td>Stage 3</td>
<td>&gt;180/110</td>
<td>Stage 2</td>
</tr>
</tbody>
</table>
PATHOGENESIS

- **Multifactorial and highly complex**
  - Can be divided into:
    - Essential (Primary): constitutes 90% of cases because etiology unknown and potential factors involved include
      - Volume
      - Renin-angiotensin system
      - Sympathetic nervous system
    - Secondary: specific cause identified (about 10% cases)
      - Primary aldosteronism
      - Cushing syndrome
      - Pheochromocytoma
      - Renovascular HTN

- **Develops**
  - (1) result of alterations in contractile properties of smooth muscle in arterial walls or
  - (2) response to failure of normal autoregulatory mechanisms within vascular beds of vital organs
HTN RISK FACTORS

- African Americans
- Family History
- Excess Na intake
- Excess ETOH intake
- Obesity
- Vitamin D deficiency
- Hyperlipidemia
- Physical inactivity
- Smoking
CAUSES OF HTN
HOW DO WE EVALUATE PATIENTS WITH HTN?

- Must answer a few simple questions:
  - Is the HTN new or old?
  - Are we getting accurate readings?
  - Do we think this is primary (essential) or secondary HTN?
  - Does the patient have signs or symptoms of end organ damage?
    - Hypertensive urgency
    - Hypertensive emergency
PATIENTS AT INCREASED RISK FOR HYPERTENSIVE CRISIS

- Noncompliance with antihypertensive regimen
- No primary care physician
- No medical insurance
- Alcohol related problems (withdrawal)
- Illicit drug use
- Herbal supplements (St. John’s wart, Yohimbine)
<table>
<thead>
<tr>
<th>Key questions regarding history of present illness</th>
<th>Comments/Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever been told you have high blood pressure?</td>
<td>Open-ended, inclusive questions; many people do feel they have HTN if they are taking medication</td>
</tr>
<tr>
<td>Do you have chest pain?</td>
<td>MI, dissection</td>
</tr>
<tr>
<td>Do you have SOB?</td>
<td>MI, Dissection, CHF, Pulmonary Edema</td>
</tr>
<tr>
<td>Are you on any medications, or using recreational drugs or herbal medicines?</td>
<td>NMS, Serotonin syndrome, sympathoimetics, cocaine, pcp</td>
</tr>
<tr>
<td>Have you recently stopped taking medications or recreational drugs?</td>
<td>DTs, Clonidine or other drug withdrawal</td>
</tr>
<tr>
<td>Do you have any focal weakness?</td>
<td>Stroke, TIA, hemorrhage</td>
</tr>
<tr>
<td>Do you snore or wake up during sleep? Do you feel tired throughout the day?</td>
<td>Sleep apnea</td>
</tr>
<tr>
<td>Have you had HTN resistant to prior treatments?</td>
<td>Renovascular HTN, Hyperaldosteronism, pheochromocytoma</td>
</tr>
</tbody>
</table>
NON-EMERGENT HTN EVALUATION

- Take BP right at least 2 x on any occasion
- Take it on at least 2-3 separate days
- Take effective preventive measures in management immediately
  - weight reduction
  - decreased sodium intake
  - increase physical activity to 30 minutes/day
  - decrease alcohol intake
  - DASH eating (increase fruits, vegetables, low fat and reduced saturated fat)
PHYSICAL EXAM

- SHOULD BE SYSTEMATIC AND COMPLETE
  - COMPLETE SET OF VITAL SIGNS AND IN MULTIPLE EXTREMITIES IF NECESSARY
  - FUNDOSCOPIC EXAM IN WARRANTED
  - CARDIAC AND PULMONARY AUSCULTATION
  - THYROID EXAM
  - COMPLETE NEUROLOGIC EXAM TO EVALUATE FOR ANY EVIDENCE OF ISCHEMIA OR DEFICITS
  - EXTREMITY EXAM TO EVALUATE CIRCULATION AND EDEMA
# INITIAL LAB ASSESSMENT

<table>
<thead>
<tr>
<th>TEST</th>
<th>FINDINGS</th>
<th>1 VS 2 HTN</th>
<th>CV RISK</th>
<th>ORGAN DAMAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>H/H</td>
<td>ANEMIA</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>UA</td>
<td>PROTEIN/BLOOD/GLUCOSE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>POTASSIUM</td>
<td>HYPO-ALDOSTERONE EXCESS</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CREATININE</td>
<td>KIDNEY DISEASE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GLUCOSE</td>
<td>DM</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>LIPID PROFILE</td>
<td>HIGH TG, LDL</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>EKG</td>
<td>LVH/Q WAVES</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
ASYMPTOMATIC HTN EMERGENT MANAGEMENT


- 2 Questions Addressed:
  - 1. Accuracy and reliability of blood pressure readings in the ED for screening asymptomatic patients for HTN
  - 2. Is there benefit of rapid lowering of elevated blood pressures in the ED.

- 2 Answers
  - 1. If blood pressure persistently elevated >140/90 then should be referred to pcp for BP management (level B)
  - 2. Initial lowering is not necessary if have close follow up. Rapid lowering of BP may be harmful in asymptomatic patients. If attempted then gradual lowering should be target and not normalization. (level B)
ASYMPTOMATIC HTN
EMERGENT
MANAGEMENT


- 2 New Questions Addressed:
  - 1. In ED patients with asymptomatic HTN, does screening for target organ injury reduce rates of adverse outcomes?
  - 2. In patients with asymptomatic markedly elevated blood pressures, does ED medical intervention reduce rates of adverse outcomes?

- 2 Answers:
  - 1. In ED patients routine screening is not required. In select populations (poor follow up), screening for creatinine may affect disposition. (level C)
  - 2. Routine ED medical intervention not required. In select populations treatment in ED or initiating medication is appropriate. Patients should be referred for follow up. (level C)
Figure 1. Mechanisms Of Antihypertensive Medications

Cardioselective Agents
- β-blockers
- Calcium channel blockers

Vasoactive Agents
- Nitrates
- Hydralazine
- Calcium channel blockers
- α-blockers

Diuretics
- Thiazides
- Loop diuretics
- Nesiritide
- Potassium-sparing diuretics

Renin-Angiotensin Modifiers
- Angiotensin-converting enzyme inhibitors
- Angiotensin receptor blockers
- Spironolactone
Figure. 2014 Hypertension Guideline Management Algorithm

Adult aged ≥18 years with hypertension

Implement lifestyle interventions (continue throughout management).

Set blood pressure goal and initiate blood pressure lowering medication based on age, diabetes, and chronic kidney disease (CKD).

General population (no diabetes or CKD) vs Diabetes or CKD present

Age ≥60 years vs Age <60 years vs All ages vs All ages

Diabetes present vs No CKD vs CKD present with or without diabetes

Blood pressure goal:
- SBP <150 mm Hg
- DBP <90 mm Hg

Blood pressure goal:
- SBP <140 mm Hg
- DBP <90 mm Hg

Blood pressure goal:
- SBP <140 mm Hg
- DBP <90 mm Hg

Blood pressure goal:
- SBP <140 mm Hg
- DBP <90 mm Hg

Nonblack vs Black vs All races

Initiate thiazide-type diuretic or ACEI or ARB or CCB, alone or in combination.

Initiate thiazide-type diuretic or CCB, alone or in combination.

Initiate ACEI or ARB, alone or in combination with other drug class.

Select a drug treatment titration strategy:
A. Maximize first medication before adding second or
B. Add second medication before reaching maximum dose of first medication or
C. Start with 2 medication classes separately or as fixed-dose combination.

At goal blood pressure?

Yes

Reinforce medication and lifestyle adherence.
For strategies A and B, add and titrate thiazide-type diuretic or ACEI or ARB or CCB (use medication class not previously selected and avoid combined use of ACEI and ARB).
For strategy C, titrate doses of initial medications to maximum.

No
"I heard that smokers live an average of 60 years. That’s a lot longer than I’d live if I didn’t smoke!"
EMERGENCY EVALUATION

- Hypertensive Urgency (DBP >110)
  - No signs or symptoms of end organ damage

- Hypertensive Emergency
  - Acute end-organ damage
    - Brain (encephalopathy, stroke, IC hemorrhage)
    - Eyes (papilledema)
    - Heart (ACS)
    - Lungs (pulmonary edema)
    - Aorta (dissection)
    - Kidneys (ARF)
    - Uterus (eclampsia)
  - Requires IV medications and rapid lowering of BP in 1-2 hours
DIFFERENTIAL OF HTN EMERGENTLY:

<table>
<thead>
<tr>
<th>Acutely Dangerous</th>
<th>Less Acutely Dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>Obstructive uropathy</td>
</tr>
<tr>
<td>Aortic Dissection</td>
<td>hyperthyroidism/parathyroid</td>
</tr>
<tr>
<td>Drug intoxication: cocaine,</td>
<td>Sleep apnea</td>
</tr>
<tr>
<td>amphetamine, MAOI</td>
<td></td>
</tr>
<tr>
<td>Drug Withdrawal: antihypertensives, alcohol</td>
<td>Cushing syndrome</td>
</tr>
<tr>
<td>Renal failure</td>
<td>Primary aldosteronism</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td>Renovascular HTN</td>
</tr>
<tr>
<td>Thyroid Storm</td>
<td>Essential HTN</td>
</tr>
</tbody>
</table>
WORK UP EMERGENTLY

- Labs
  - CBC
  - BMP
  - TROPOIN
  - COAGULATION PANEL
  - UA
- RADIOLOGY
  - CT HEAD
  - CXR
  - CT CHEST
- EKG
Cardiopulmonary

- most commonly affected organ system
  - acute aortic dissection
  - ACS
  - Acute Left Ventricular failure
  - S/P CABG

Renal

- Acute renal failure
- renal crisis from collagen vascular disease
- severe HTN after transplantation

Ophthalmologic

- Papilledema
- Retinal hemorrhages
HTN
EMERGENCIES/END ORGAN DAMAGE

- CNS
  - Hypertensive encephalopathy
  - Ischemic or hemorrhagic CVA
  - SAH
  - Intracerebral hemorrhage

- Hematologic
  - Microangiopathic hemolytic anemia
  - Severe epistaxis
  - Postoperative bleeding from vascular suture lines

- Eclampsia

- Excessive Circulating catecholamines
  - Pheochromocytoma
  - Cocaine
  - Rebound HTN after medication cessation
**HTN EMERGENCY/DRUG TREATMENT OPTIONS**

- **Sodium nitroprusside**
  - Mode of action: arterial and venous dilation
  - Onset: 1-2 minutes
  - Metabolized to thiocyanate (cyanide) therefore do not use for long in renal or pregnant patients
  - Ideal medication for hypertensive emergencies (rapid onset, potent, short half-life)
  - Can cause reflex tachycardia, therefore use with beta blocker

- **Labetalol**
  - Alpha and beta blocker (primarily beta)
  - Onset: 5-10 minutes
  - Half life: 5.5 hours
  - Low doses may lead to paradoxical HTN due to predominant beta effect (unopposed alpha)
  - **Contraindicated in bronchospasm, CHF, AV blocks**
Medications cont’d

- **Nitroglycerin**
  - Venodilation primarily; arteriolar dilation at high doses
  - Limited utility with profound HTN
  - Onset: immediate
  - Half life: 4 minutes
  - Tachyphylaxis
  - Ideal for cardiac emergencies such as CHF, MI
  - Side effects: headache and tachycardia

- **Nicardipine**
  - CCB
  - Onset: 5-15min
  - Duration: 4-6 hours
  - Theoretically reduces cardiac and cerebral ischemia

- **Fenoldopam**
  - Dopamine agonist, no alpha or beta effects
  - Onset: 5 min
  - Duration: 30-60min
  - Increases renal blood flow and sodium excretion
  - Might be preferred agent in the setting of renal dysfunction
Medications cont’d

- **Hydralazine**
  - Direct arteriolar vasodilator
  - Onset: 10 min (IV)
  - Half-life: 2-4 hours
  - Indicated in pregnancy-related HTN, pediatric nephritis
  - Side effects include reflex tachycardia (limits use in CAD, Dissection), chronic use associated with “lupus-like” syndrome
<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Onset of Action</th>
<th>Duration of Action</th>
<th>Adverse Effects†</th>
<th>Special Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vasodilators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium nitroprusside</td>
<td>0.25-10 μg/kg/min as IV infusion†</td>
<td>Immediate</td>
<td>1-2 min</td>
<td>Nausea, vomiting, muscle twitching, sweating, thiocyanate and cyanide intoxication. May increase intracranial pressure</td>
<td>Most hypertensive emergencies; caution with high intracranial pressure or azotemia</td>
</tr>
<tr>
<td>Nicardipine hydrochloride</td>
<td>5-15 mg/h IV</td>
<td>5-10 min</td>
<td>15-30 min, may exceed 4 hrs</td>
<td>Tachycardia, headache, flushing, local phlebitis</td>
<td>Most hypertensive emergencies except acute heart failure; caution with coronary ischemia</td>
</tr>
<tr>
<td>Fenoldopam mesylate</td>
<td>0.1-0.3 μg/kg/min IV infusion</td>
<td>&lt; 5 min</td>
<td>30 min</td>
<td>Tachycardia, headache, nausea, flushing</td>
<td>Most hypertensive emergencies; caution with glaucoma</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>5-100 μg/min as IV infusion‡</td>
<td>2-5 min</td>
<td>5-10 min</td>
<td>Headache, vomiting, methemoglobinemia, tolerance with prolonged use</td>
<td>Coronary ischemia</td>
</tr>
<tr>
<td>Enalaprilat</td>
<td>1.25-5 mg every 6 hrs IV</td>
<td>15-30 min</td>
<td>6-12 hrs</td>
<td>Precipitous fall in pressure in high-renin states; variable response</td>
<td>Acute left ventricular failure; avoid in acute myocardial infarction</td>
</tr>
<tr>
<td>Hydralazine hydrochloride</td>
<td>10-20 mg IV 10-40 mg IM</td>
<td>10-20 min IV 4-6 hrs IM</td>
<td>1-4 hrs IV</td>
<td>Tachycardia, flushing, headache, vomiting, aggravation of angina</td>
<td>Eclampsia</td>
</tr>
<tr>
<td><strong>Adrenergic Inhibitors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labetalol hydrochloride</td>
<td>20-80 mg IV bolus every 10 min 0.5-2.0 mg/min IV infusion</td>
<td>5-10 min</td>
<td>3-6 hrs</td>
<td>Vomiting, scalp tingling, bronchoconstriction, dizziness, nausea, heart block, orthostatic hypotension</td>
<td>Most hypertensive emergencies except acute heart failure</td>
</tr>
<tr>
<td>Esmolol hydrochloride</td>
<td>250-500 μg/kg/min IV bolus, then 50-100 μg/kg/min by infusion; may repeat bolus after 5 min or increase infusion to 300 μg/min</td>
<td>1-2 min</td>
<td>10-30 min</td>
<td>Hypotension, nausea, asthma, first-degree heart block, heart failure</td>
<td>Aortic dissection, perioperative</td>
</tr>
<tr>
<td>Phentolamine</td>
<td>5-15 mg IV bolus</td>
<td>1-2 min</td>
<td>10-30 min</td>
<td>Tachycardia, flushing, headache</td>
<td>Catecholamine excess</td>
</tr>
</tbody>
</table>

Abbreviations: h, hour; hrs, hours; IM, intramuscular; IV, intravenous; min, minute(s).
* These doses may vary from those in the Physicians’ Desk Reference (51*ed.)*
† Hypotension may occur with all agents
‡ Requires special delivery system
TREATMENT BY CONDITION

- **Acute Ischemic Stroke**
  - Can be cerebral protective
  - Usually rely on expert opinion
  - If >220/120 then initiate IV therapy
  - Labetalol or nicardipine IV is preferred treatment options
  - Second-line nitroprusside (may raise ICP)
  - Goal is 10-15% reduction in BP

- **Acute Pulmonary Edema/CHF**
  - Hypertensive Heart failure = HF + Hypertension
  - Nitroglycerin or nitroprusside
  - Lasix IV
TREATMENT BY CONDITION

- Hypertensive encephalopathy
  - Rapid rise in BP that overwhelms the autoregulatory mechanisms of the brain and leads to blood-brain permeability and brain edema
  - Headache, seizures, visual disturbance, nausea and vomiting
  - No preferred agent
  - Treatment goal is 20-25% reduction in MAP or a DBP of 100-110
TREATMENT BY CONDITION

- Acute Intracerebral Hemorrhage
  - Must maintain sufficient perfusion pressure to the brain without worsening the amount of hemorrhage
  - Nicardipine is becoming the preferred agent at this time

1. If SBP is >200 mm Hg or MAP is >150 mm Hg, then consider aggressive reduction of BP with continuous intravenous infusion, with frequent BP monitoring every 5 min.

2. If SBP is >180 mm Hg or MAP is >130 mm Hg and there is the possibility of elevated ICP, then consider monitoring ICP and reducing BP using intermittent or continuous intravenous medications while maintaining a cerebral perfusion pressure ≥60 mm Hg.

3. If SBP is >180 mm Hg or MAP is >130 mm Hg and there is not evidence of elevated ICP, then consider a modest reduction of BP (eg, MAP of 110 mm Hg or target BP of 160/90 mm Hg) using intermittent or continuous intravenous medications to control BP and clinically reexamine the patient every 15 min.

Note that these recommendations are Class C. SBP indicates systolic blood pressure; MAP, mean arterial pressure.
TREATMENT BY CONDITION

- **Aortic Dissection**
  - false lumen created in the wall of the aorta
  - Stanford classification
    - Type A: any involvement of the ascending aorta (proximal to left subclavian artery)
      - Require emergent surgical procedure
    - Type B: spares the ascending aorta
      - Medical management with surgical consultation
  - Treatment:
    - Pain medications
    - Esmolol
    - Nitroprusside
  - Treatment goal: lowest pressure tolerated by the patient to SBP 100-120 and heart rate control to 60-70
TREATMENT BY CONDITION

- **Sympathetic crisis**
  - Can be caused from withdrawal, or due to recreational drug use (cocaine, methamphetamine, PCP)
  - **Treatment**
    - Cocaine
      - Benzo’s to calm patient first
      - Phentolamine and nitro
    - PCP
      - Benzo’s
    - Pheochromocytoma
      - Oral alpha-blockers (doxazosin)
      - Phentolamine
      - Nicardipine
TREATMENT BY CONDITION

- **Unstable angina/NSTEMI/MI**
  - Nitroglycerin
  - Beta-blockers IV or oral within 24 hours
  - ACE inhibitors oral or IV can be used for HTN and LV dysfunction

- **Preeclampsia/Eclampsia**
  - HTN + Proteinuria +/- seizure
  - After 20\textsuperscript{th} week of gestation
  - Goal is to lower to 140/90
  - Labetalol/methyldopa/hydralazine/nicardipine agents of choice

- **Renal Failure**
  - ACE or ARB medication options
DISPOSITION

HTN

NO END ORGAN DAMAGE/SYMPTOMS

SEND HOME/MEDICATIONS

END ORGAN DAMAGE/SYMPTOMS

FOLLOW UP IN 2 DAYS WITH PCP

ADMIT FOR HTN URGENCY/EMERGENCY
REFERENCES


- Brown A. Approach To The Patient With Hypertension. ACOFP 2012 Conference Presentation.


THANK YOU

SOMETIMES I FEEL THAT I HAVE THE WORST JOB IN THE WORLD!

YA...RIGHT!