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Author(s): Keith Kocher (University of Michigan), M.D. MPH 2010

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Hypertensive Urgency and Emergencies

Keith Kocher, MD MPH

August 11th, 2010

University of Michigan

Department of Emergency Medicine

Objectives

- Know how to evaluate someone who is hypertensive (which may mean doing nothing)
- Know how to distinguish between hypertensive emergencies and non-emergencies—and how to manage them
- Competently be able to appropriately disposition patients over the range of hypertension problems—from someone with an elevated blood pressure to hypertensive emergencies

Outline

- Background
- Small group discussion
- Evidence based lecture
- Final thoughts and questions/comments

Lecture/Topic Boundaries

- Lecture confined to evaluation and management of hypertension within the ED setting
- Adults
- Will touch on several disease processes, but not the definitive lecture on managing the entire range of hypertensive emergencies

Lecture/Topic Boundaries

- I want to specifically encourage interruptions, questions, and discussion during my talk
- You will find that there is a lack of evidence based medicine support for many of these issues
- You will find that there are many ways of managing these patients
- You will find there may be local/regional and generational differences in physician (PCP and EP) management

Definitions

- Elevated blood pressure
  - Hypertension without an underlying diagnosis of hypertension
- Hypertension
  - The disease of chronically elevated blood pressure
- Essential hypertension (90%)
  - Hypertension without a specific secondary cause
- Secondary hypertension (10%)
  - Hypertension related to an underlying pathologic process (adrenal disease, renal disease, etc)

Table 3. Classification of blood pressure for adults

Blood Pressure Classification	SBP mmHg	DBP mmHg
Normal	<120	and <80
Prehypertension	120–139	or 80–89
Stage 1 Hypertension	140–159	or 90–99
Stage 2 Hypertension	≥160	or ≥100

SBP, systolic blood pressure; DBP, diastolic blood pressure

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute,

Definitions

- **Hypertensive crisis**
  - **A hypertensive urgency or emergency**
- **Hypertensive urgency**
  - **Severe elevations in BP without progressive *target organ dysfunction***
- **Hypertensive emergency**
  - **Characterized by severe elevations in BP (>180/120) complicated by evidence of impending or progressive *target organ dysfunction***
- **Malignant hypertension**
  - **Old term, varying definitions, unlikely to find in recent guidelines**
  - **Severely elevated blood pressure with retinal hemorrhages or papilledema vs. encehalopathy or acute nephropathy**

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute,

Definitions

- Target organ dysfunction or end organ damage:
  - Brain
  - Retina
  - Heart
  - Arteries
  - Kidney

- Then decide what it means to have "dysfunction" or "damage"?
  - Headache vs. hemorrhage
  - Chest pain vs. CHF

Target Organ Damage	
Heart	(chronic conditions)
LVH	
Angina/prior MI	
Prior coronary revascularization	
Heart failure	
Brain	
Stroke or transient ischemic attack	
Dementia	
CKD	
Peripheral arterial disease	
Retinopathy	

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute, 2003.

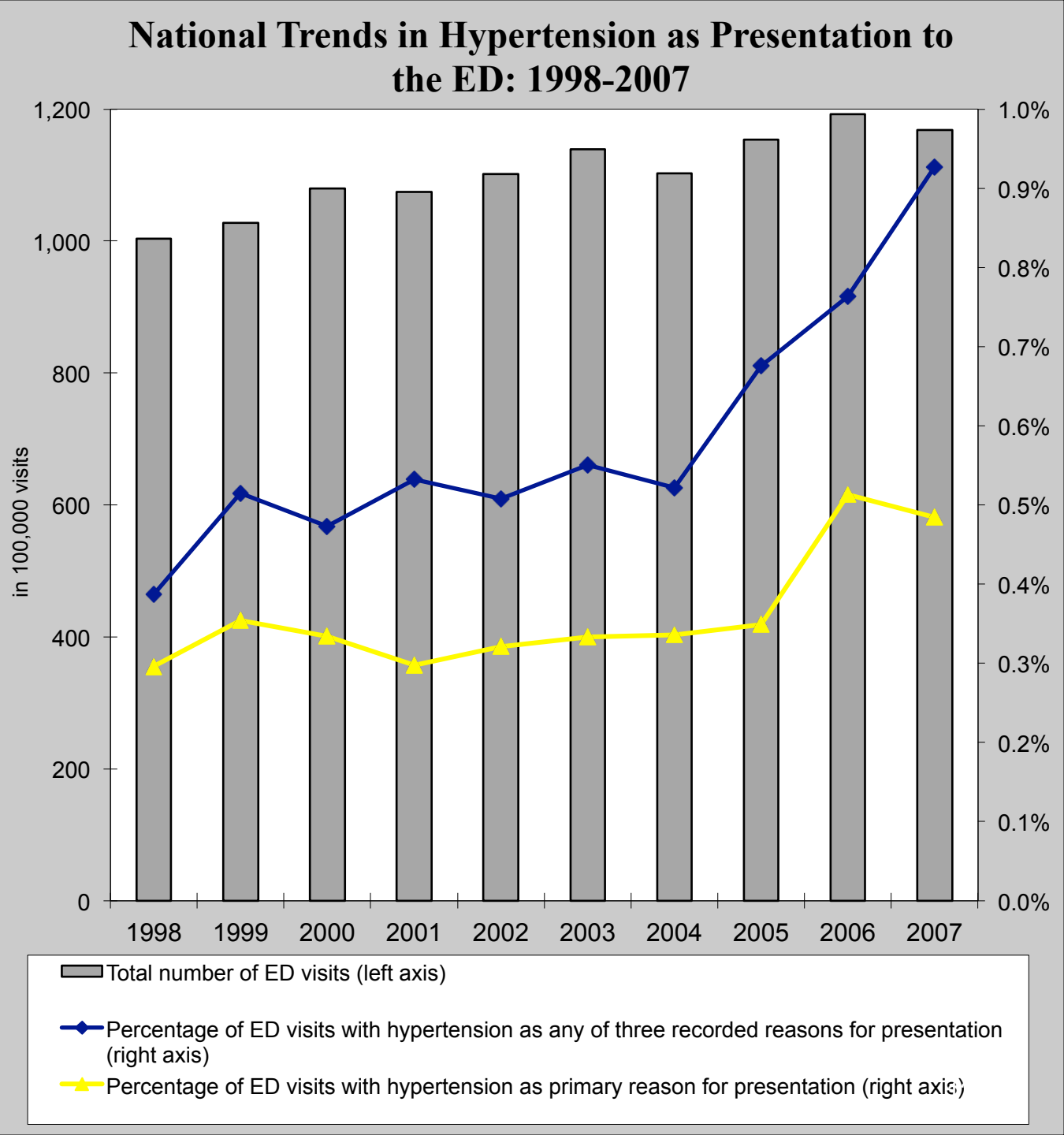
Epidemiology

- **Why do we care about treating hypertension?**
  - Major public health problem

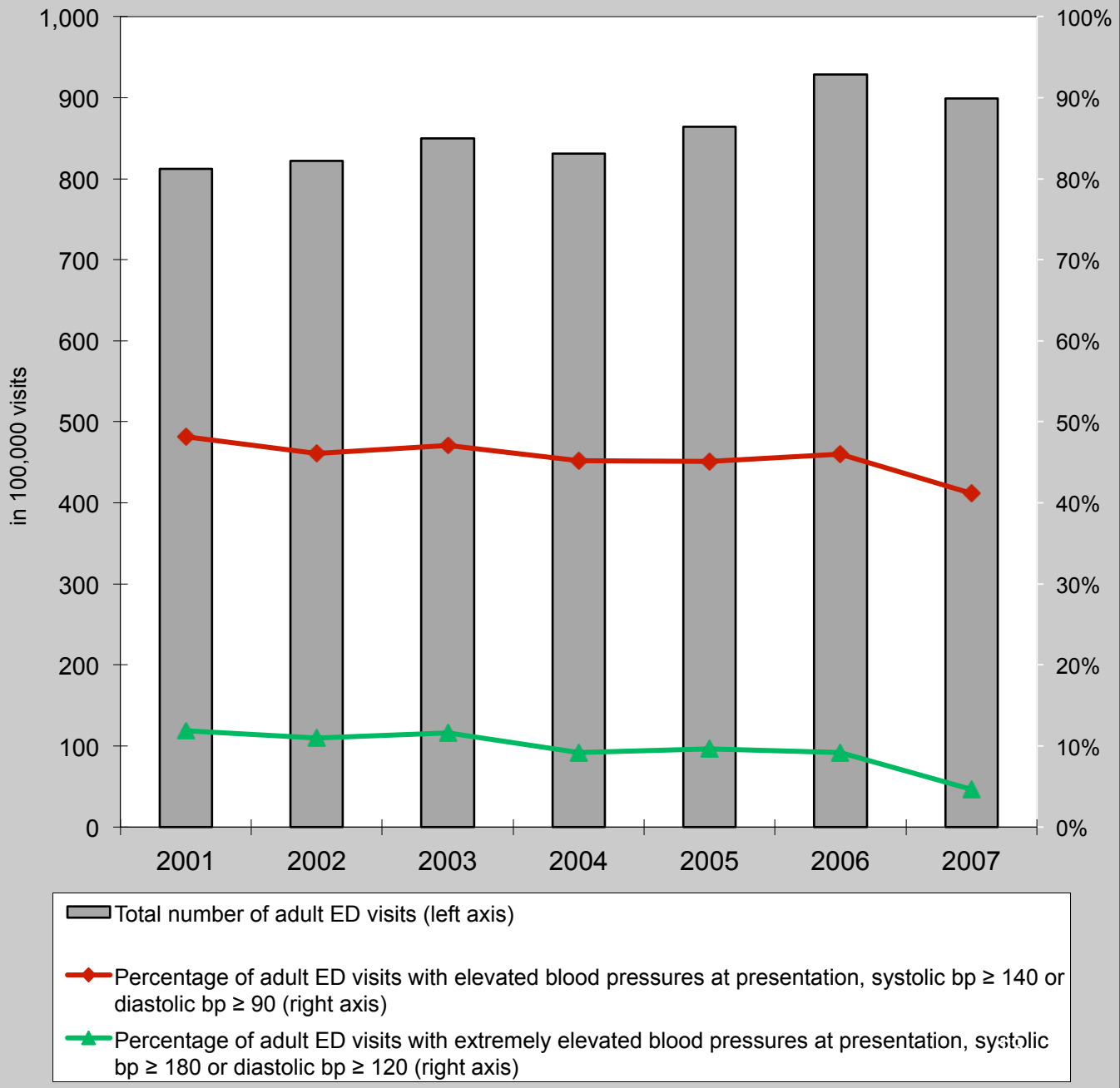
- **Represents a huge burden of disease:**
  - Affects ~30% of population over age 20
  - More than half of people 60–69 years of age and approximately three-fourths of those 70 years of age and older are affected
  - The relationship between BP and risk of cardiovascular events is continuous, consistent, and independent of other risk factors
  - The higher the BP, the greater the chance of heart attack, heart failure, stroke, and kidney diseases
  - For every 20 mmHg systolic or 10 mmHg diastolic increase in BP, there is a doubling of mortality from both ischemic heart disease and stroke

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute, 2003.

- From the National Hospital Ambulatory Medical Care Survey (NHAMCS)
- CDC database tracking ED specific information starting in 1992
- Codes for up to three reasons for visit
- Often associated with other complaints: headache, chest pain, vertigo/ dizziness, dyspnea, abdominal pain, palpitations, epistaxis

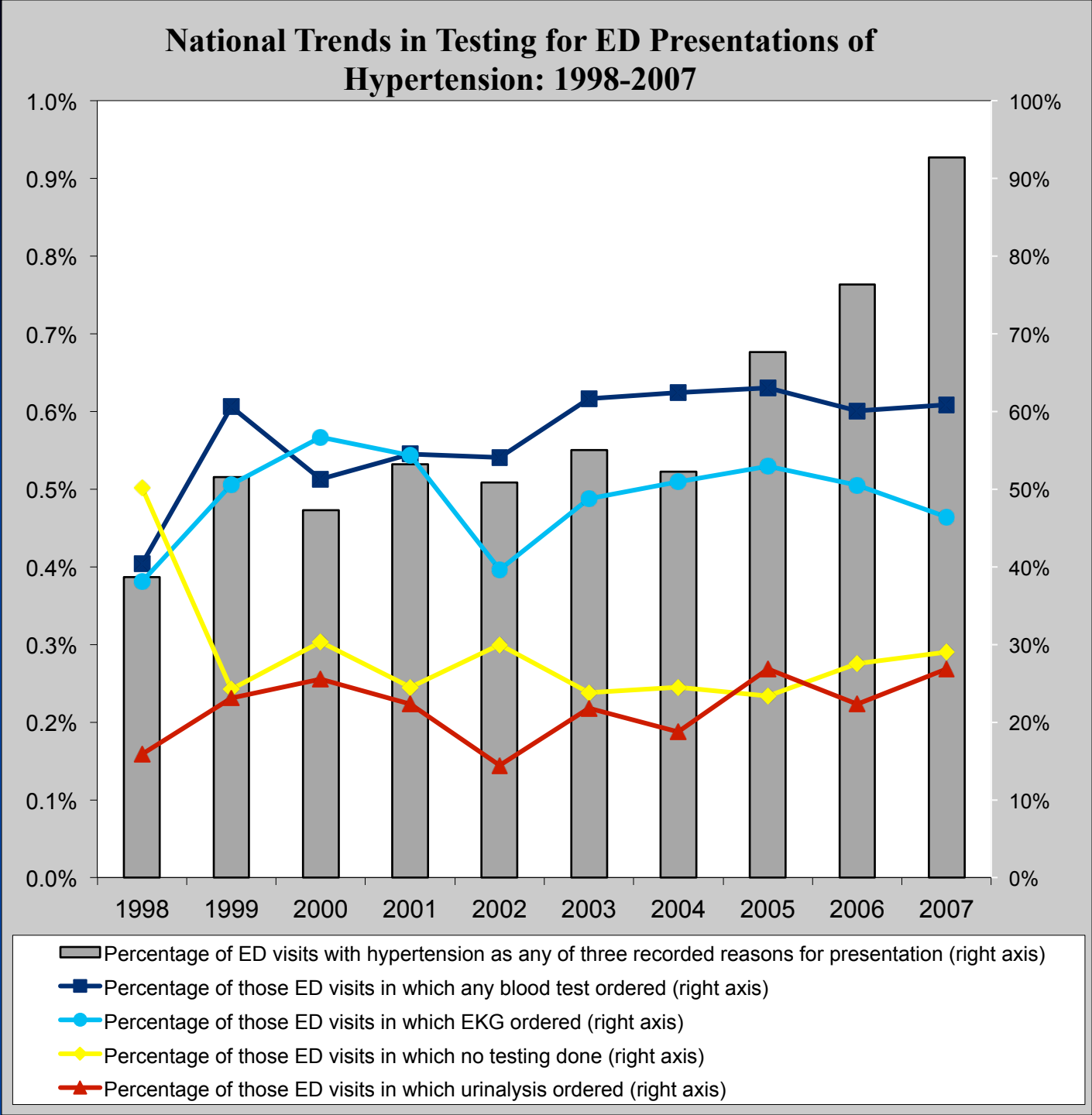


- From NHAMCS
- Database began recording vital signs starting in 2001
- Adults defined as age ≥ 18
- Almost 50% of adult ED patients present with elevated blood pressures in the range of "stage 1" hypertension
- Almost 10% of adult ED patients present with elevated blood pressures in the hypertensive crisis range

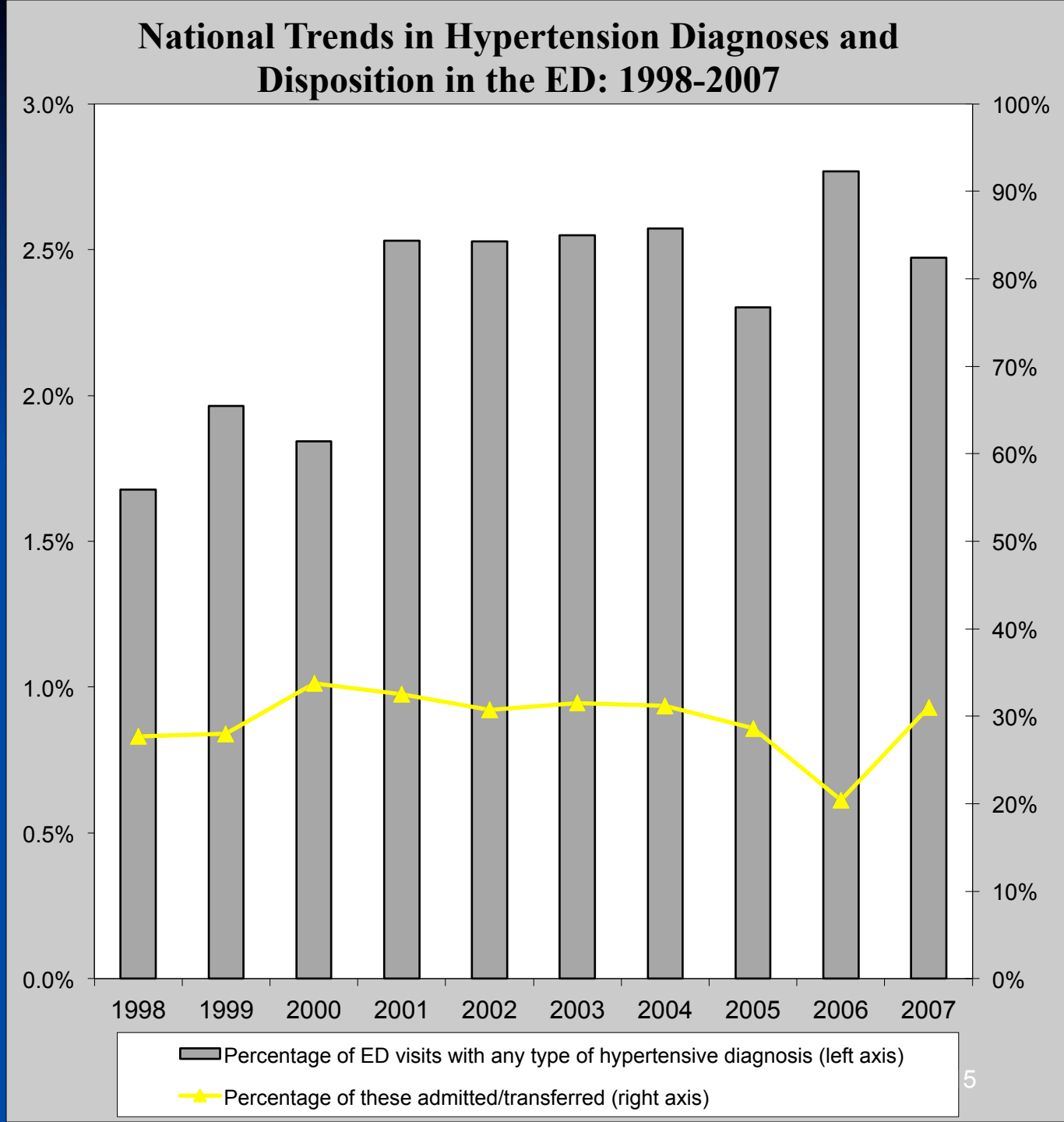


NHAMCS

- From NHAMCS
- For patients presenting to ED with blood pressure or hypertension as any of the 3 reasons for visit
- Trends in testing:
  - Any blood test (~60%)
  - EKG (~50%)
  - UA (~20%)
  - No testing done (~30%)



- From NHAMCS
- For those with any of 3 final diagnoses with specific hypertensive related diagnosis
- Includes following diagnoses (based on ICD-9 codes):
  - Elevated blood pressure reading without diagnosis of hypertension (code 796.2)
  - Hypertensive disease (codes 401-405)
- Excludes:
  - Specific disease processes in which hypertension may be aspect of care



Outline

- Background
- Small group discussion
- Evidence based lecture
- Final thoughts and questions/comments

Rules

- Groups of 4-5
- Mix of experience
  - Some junior level residents, some senior level residents, faculty spread around
- Elect a spokesperson
  - Will report back to the group

Rules

- 2 Cases

- Specifically I want you to discuss:
  - How evaluate (labs, other testing, do nothing)
  - How manage (treatment options, consultants)
  - How to disposition (admit ICU, admit, discharge, outpatient treatment, follow up instructions)

Case #1

A 53 year old man with a history of hyperlipidemia presents to your ED with a complaint of "high blood pressure." He was scheduled to undergo a dental procedure today. However his dentist noted his blood pressure to be 175/100 and therefore cancelled the procedure and sent him to the ED. Initial vital signs are: bp 180/105, pulse 90, temp 37.5, sat 99% on RA. He otherwise has no complaints. Specifically he denies chest pain, shortness of breath, headache or focal neurologic symptoms. Physical exam is normal. He denies any known diagnosis of hypertension.

Questions:

1. What do you want to do diagnostically?, therapeutically?
2. What is your disposition plan?

Case #2

A 57 year old woman with a history of hypertension presents with confusion. She is brought in by her husband. Initial vital signs are: bp 210/130, pulse 103, temp 37.5, sat 99% on RA. She is able to provide some history. She notes a headache but no focal neurologic complaints. No fever, neck pain, or rash. No chest pain, abdominal pain, back/flank pain, or shortness of breath. No trauma. Her husband states she became gradually more disoriented since yesterday and missed taking her usual anti-hypertensive medications. Physical exam is normal except she is disoriented to time and place. Head CT is negative.

Questions:

1. What additionally do you want to do diagnostically?, therapeutically?
2. What is your disposition?

Outline

- Background
- Small group discussion
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Maxim 1

Hypertension in the ED is a spectrum of disease

LESSON: You need to determine the underlying process

Teaching Point

- Spectrum of disease:

inaccurate measurement → isolated elevated blood pressure → hypertensive urgency → hypertensive emergency

  - When confronted with an elevated blood pressure, you need to determine what is the underlying process
  - How you treat may be radically different based on your assessment
  - A patient could have a blood pressure of 180/110 and be experiencing any of the above clinical scenarios

Inaccurate BP measurement

- **The accurate measurement of BP is the "sine qua non for successful management"**
  - The equipment should be regularly inspected and validated
  - The operator should be trained and regularly retrained in the standardized technique
  - The patient must be properly prepared and positioned
  - The auscultatory method of BP measurement should be used
  - Persons should be seated quietly for at least 5 minutes in a chair (rather than on an exam table), with feet on the floor, and arm supported at heart level
  - Caffeine, exercise, and smoking should be avoided for at least 30 minutes prior to measurement
  - An appropriately sized cuff (cuff bladder encircling at least 80 percent of the arm) should be used to ensure accuracy
  - At least two measurements should be made and the average recorded

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute,

Maxim 2

Asymptomatic Hypertension in the ED

LESSON: Don't just do something…stand there

Isolated elevated blood pressure

- As an emergency physician, what is your responsibility?
- Is this one of our public health missions?—to screen for hypertension
- We are not primary care physicians.
- We do not regular manage chronic hypertension.

Table 4. Recommendations for followup based on initial blood pressure measurements for adults without acute end organ damage

Initial Blood Pressure (mmHg)*	Followup Recommended†
Normal	Recheck in 2 years
Prehypertension	Recheck in 1 year‡
Stage 1 Hypertension	Confirm within 2 months‡
Stage 2 Hypertension	Evaluate or refer to source of care within 1 month. For those with higher pressures (e.g., >180/110 mmHg), evaluate and treat immediately or within 1 week depending on clinical situation and complications.

* *If systolic and diastolic categories are different, follow recommendations for shorter time followup (e.g., 160/86 mmHg should be evaluated or referred to source of care within 1 month).*

† *Modify the scheduling of followup according to reliable information about past BP measurements, other cardiovascular risk factors, or target organ disease.*

‡ *Provide advice about lifestyle modifications (see Lifestyle Modifications).*

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute, 2003.

Isolated elevated blood pressure

- Does an elevated blood pressure in the ED mean anything? And what level of elevation is significant?
- People are anxious, in pain, we don't always get accurate blood pressure measurements—especially when trying to apply these to the diagnosis of a chronic condition
- Study in Kaiser system
  - Included 407 patients without diagnosis of hypertension
  - Noted elevated BP in ED
  - Followed up in clinic
  - 70% continued to have an elevated BP…more likely with initially higher BPs in the ED
  - No difference between those with/without pain complaints or between those seen in ED vs urgent care

Backer HD, et al. Reproducibility of Increased Blood Pressure During an Emergency Department or Urgent Care Visit. *Annals of Emergency Medicine*, 2003;41(4):507-12.

Inaccurate BP measurement

- How many BP measurements would be helpful to be able to detect previously undiagnosed hypertension in an ED patient?

- Conducted in adult ED at Johns Hopkins
  - Patients presenting to non-urgent side of ED
  - 203 patients
  - Found that important to include 2 readings as first was generally higher
  - Using 3 readings did not significantly improve capture of patients with hypertension

Mamon J, et al. Using the ED as a Screening Site for High Blood Pressure. *Medical Care*, 1987 25(8):770-80.

Isolated elevated blood pressure

- Testing
  - Recommendations from JNC 7 for outpatient setting:
    - EKG
    - UA, CBC, basic, cholesterol panel
    - More extensive testing for causes of secondary hypertension not necessary
  - Not specifically addressed by ACE

Laboratory Tests and Other Diagnostic Procedures

- Routine lab tests recommended before initiating therapy: 12-lead electrocardiogram; urinalysis, blood glucose and hematocrit; serum potassium, creatinine, calcium^-66, and a lipoprotein profile that includes high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides
- Optional tests: measurement of urinary albumin excretion or albumin/ creatinine ratio (ACR) except for those with diabetes or kidney disease where annual measurements should be made. More extensive testing for identifiable causes is not generally indicated unless BP control is not achieved or the clinical and routine lab evaluation strongly suggests an identifiable secondary cause

- If we are ad hoc PCP's for some patients, what is our responsibility to do testing?
- Timing of these tests?

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute, 2003.

Isolated elevated blood pressure

- Treatment?
  - Lower blood pressure in ED
  - Discharge with script to start an anti-hypertensive
  - Discuss with PCP over phone and mutually decide on anti-hypertensive to discharge with
  - Refer to PCP to decide what to do
  - Do nothing

- Rapidly lowering an elevated BP may cause harm
- Some patients with elevated BP in the ED may not have elevation on follow up in clinic

Decker WW, et al. Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients with Asymptomatic Hypertension in the ED. *Annals of Emergency Medicine*, 2006;47(3):237-49.

Isolated elevated BP: ACEP

- "Rapidly lowering blood pressure in asymptomatic patients in the ED is unnecessary and may be harmful in some patients." (Level B evidence)
- "Initiating treatment for asymptomatic hypertension in the ED is not necessary when patients have follow-up." (Level B evidence)
- "When ED treatment for asymptomatic hypertension is initiated, blood pressure management should attempt to gradually lower blood pressure and should not be expected to be normalized during the initial ED visit." (Level B evidence)

Decker WW, et al. Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients with Asymptomatic Hypertension in the ED. *Annals of Emergency Medicine*, 2006;47(3):

Isolated elevated BP: ACEP

- **"If blood pressure measurements are persistently elevated with a systolic blood pressure greater than 140 mm Hg or diastolic blood pressure greater than 90 mm Hg, the patient should be referred for follow-up of possible hypertension and blood pressure management." (Level B evidence)**

- **"Patients with a single elevated blood pressure reading may require further screening for hypertension in the outpatient setting." (Level C evidence)**

Decker WW, et al. Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients with Asymptomatic Hypertension in the ED. *Annals of Emergency Medicine*, 2006;47(3):

Hypertensive Urgency

- Does this exist?, is this a disease?
- Not an ICD-9 code for this
- Probably we're talking about a clinical scenario:
  - (1) a severely elevated blood pressure in patient with
  - (2) a history of known hypertension (perhaps not always)
  - (3) without end organ dysfunction (asymptomatic)

Hypertensive Urgency

- Evaluation
- History
  - Can be tricky if its hypertension + complaints
- Physical exam
  - Bruits?
  - Murmurs?
  - Retina?
- Studies?
  - CBC, basic, UA
  - EKG
  - CXR

- Treatment
  - Treat any underlying end organ dysfunction
  - Apply same strategy as with those with isolated elevated blood pressure?
  - Do nothing?
  - Have patient take home anti-hypertensive medications?
  - Refer back to PCP?

Hypertensive Urgency

- **From JNC 7, appears to be expert opinion:**

"

- Some patients with hypertensive urgencies may benefit from treatment with: oral, short-acting agent such as captopril, labetalol, or clonidine followed by several hours of observation
- No evidence to suggest that failure to aggressively lower BP in the ER is associated with any increased short-term risk to the patient who presents with sever hypertension
- Such a patient may benefit from: adjustment in their antihypertensive therapy (particularly the use of combination drugs, or reinstitution of medication if noncompliance is a problem
- Patients should not leave the ER without a confirmed followup visit within several days

"

"

- Term "urgency" has led to overly aggressive management of many patients with severe, uncomplicated hypertension
- Aggressive dosing with intravenous drugs or even oral agents, to rapidly lower BP is not without risk
- Oral loading doses of antihypertensive agents can lead to cumulative effects causing hypotension, sometimes following discharge from the ER
- Patients who continue to be noncompliant will often return to the ER within weeks

"

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute,

Maxim 3

Not all hypertensive emergencies are the same

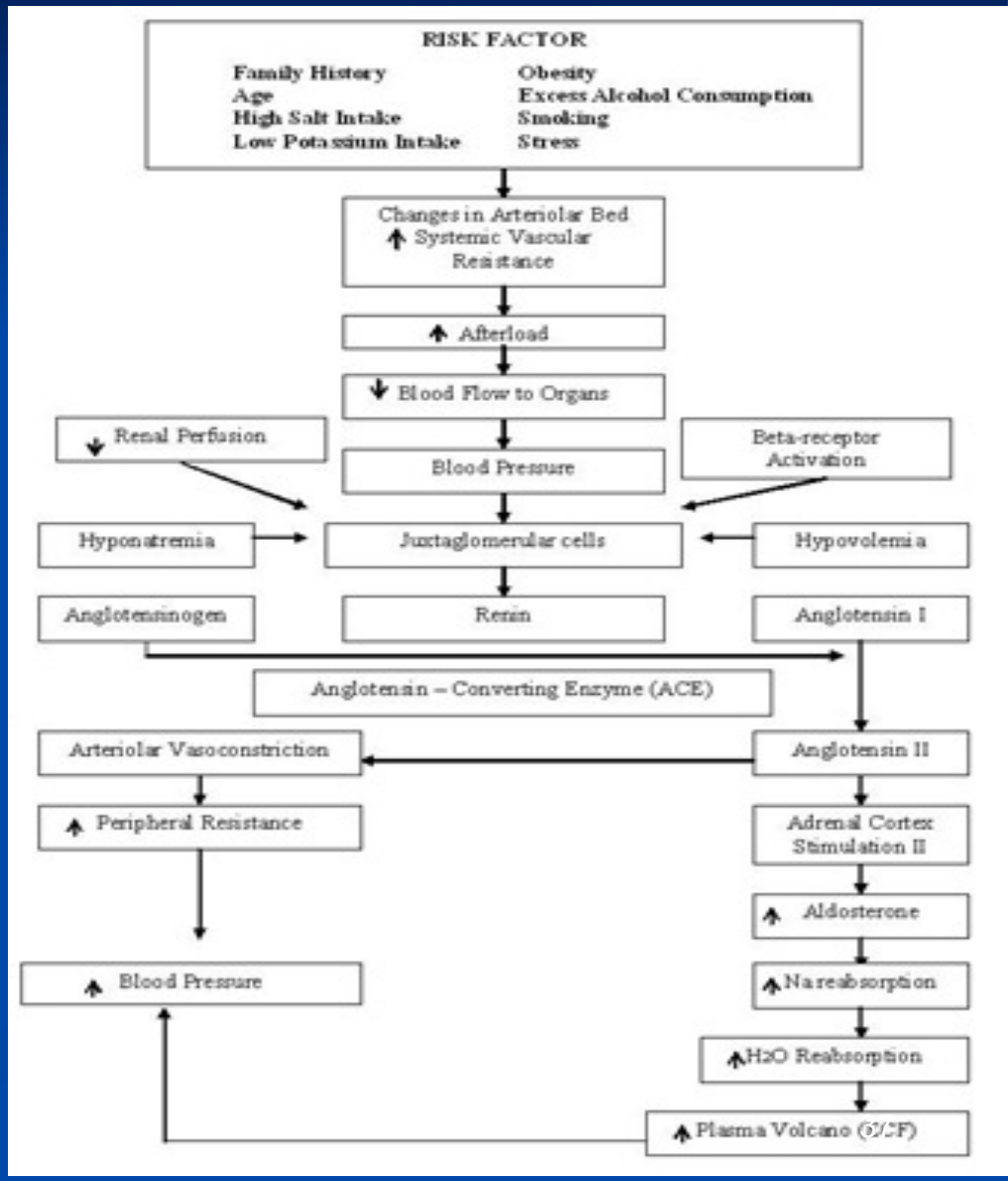
LESSON: Treatment is based on the underlying cause

Teaching Point

- Hypertensive emergencies are probably better categorized by the underlying pathophysiology of the individual disease
  - Think of the hypertension as a manifestation of that disease
  - Think of the treatment as being determined by that individual disease process
  - You may not think of the myriad of diseases that we deal with everyday as being hypertensive emergencies

Pathophysiology

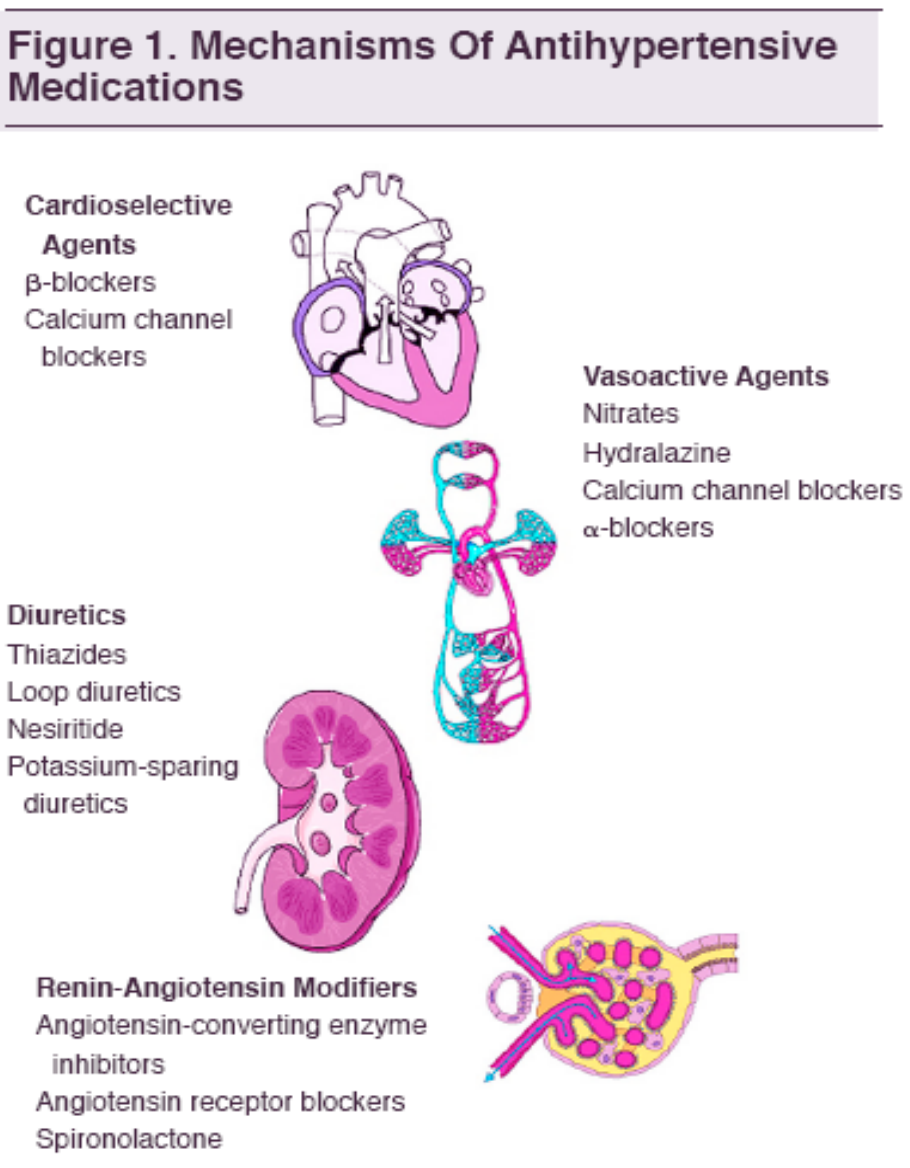
- Primary actors:
  - Kidneys
  - Adrenals
  - Vascular bed
  - Heart



Pathophysiology

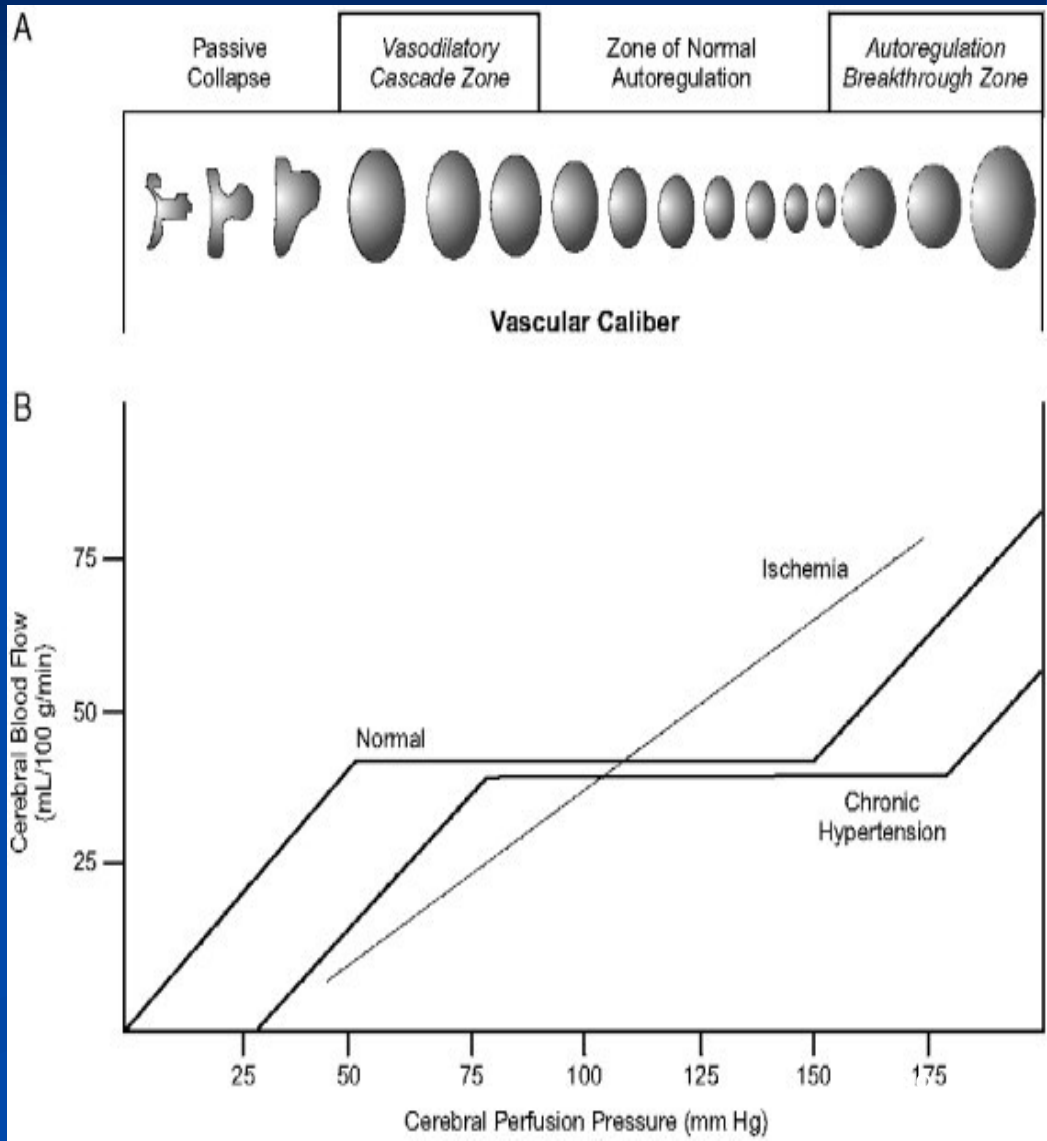
- Receptors:
  - Beta blockers
  - Calcium channel blockers
  - Angiotensin-Renin system
  - Alpha blockers
  - Diuretics

Figure 1. Mechanisms Of Antihypertensive Medications



Pathophysiology

- Concept of autoregulation
  - Chronic hypertension shifts curve and range of BP's under which brain regulates its blood flow
  - Therefore in hypertensives, need higher BP's to maintain cerebral perfusion
  - Underpins BP management in stroke



(ED) Hypertensive Emergencies

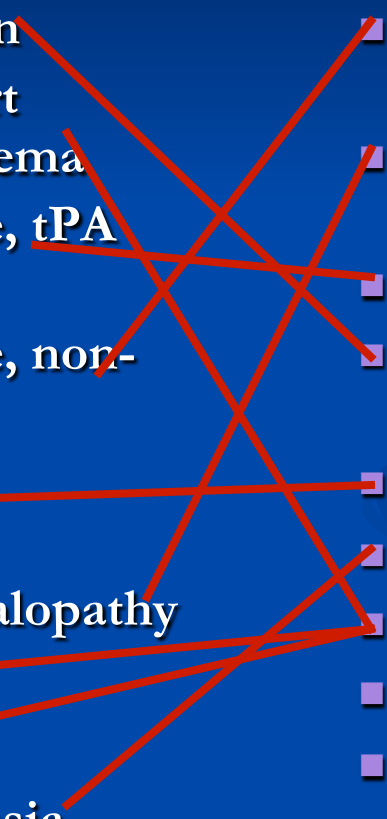
- Cardiovascular system
  - Acute aortic dissection
  - Congestive heart failure/ pulmonary edema
- Neurologic system
  - Ischemic stroke
  - Hemorrhagic stroke
  - Subarachnoid hemorrhage
  - Hypertensive encephalopathy
- Acute renal failure
  - Nephrotic and nephritic syndromes
- Endocrine
  - Thyroid storm
  - Pheochromocytoma
- Drug related
  - Sympathomimetic toxidrome (cocaine/amphetamine toxicity)
  - MAOI toxicity
  - Withdrawal (alcohol)
- Pregnancy related
  - Preeclampsia/eclampsia

Hypertensive Encephalopathy

- Definition
  - A reversible cerebral disorder associated with a high BP in the absence of cerebral thrombosis or hemorrhage
- Symptoms
  - Headache, seizures, visual disturbances, nausea, vomiting, confusion
- Diagnosis
  - Made after excluding other pathology
- Cause
  - Theorized that a rapid rise in BP overwhelms the autoregulatory mechanisms of the brain and leads to blood-brain barrier permeability and brain edema

Let's Play a Game: Target BP

- Disease
  - Acute aortic dissection
  - Acute congestive heart failure/pulmonary edema
  - Acute ischemic stroke, tPA candidate
  - Acute ischemic stroke, non-tPA candidate
  - Acute intracranial hemorrhage
  - Hypertensive encephalopathy
  - Cocaine toxicity
  - Delirium tremens
  - Preeclampsia/eclampsia
- Target BP
  - 10-15% reduction in mean arterial pressure
  - 20-25% reduction in mean arterial pressure
  - Under 185/110
  - Systolic BPs as low as tolerable (100-120 mmHg)
  - Goal 160/90
  - Goal 140/90
  - Treat the cause, not the BP
  - None of the above
  - Unknown



- **IV drug options**

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). National Heart, Lung, and Blood Institute, 2003.

Table 23. Parenteral drugs for treatment of hypertensive emergencies*

Drug	Dose	Onset of Action	Duration of Action	Adverse Effects†	Special Indications
Vasodilators					
Sodium nitroprusside	0.25–10 µg/kg/min as IV infusion‡	Immediate	1–2 min	Nausea, vomiting, muscle twitching, sweating, thiocynate and cyanide intoxication	Most hypertensive emergencies; caution with high intracranial pressure or azotemia
Nicardipine hydrochloride	5–15 mg/h IV	5–10 min	15–30 min, may exceed 4 hrs	Tachycardia, headache, flushing, local phlebitis	Most hypertensive emergencies except acute heart failure; caution with coronary ischemia
Fenoldopam mesylate	0.1–0.3 µg/kg per min IV infusion	<5 min	30 min	Tachycardia, headache, nausea, flushing	Most hypertensive emergencies; caution with glaucoma
Nitroglycerin	5–100 µg/min as IV infusion‡	2–5 min	5–10 min	Headache, vomiting, methemoglobinemia, tolerance with prolonged use	Coronary ischemia
Enalaprilat	1.25–5 mg every 6 hrs IV	15–30 min	6–12 hrs	Precipitous fall in pressure in high-renin states; variable response	Acute left ventricular failure; avoid in acute myocardial infarction
Hydralazine hydrochloride	10–20 mg IV 10–40 mg IM	10–20 min IV 20–30 min IM	1–4 hrs IV 4–6 hrs IM	Tachycardia, flushing, headache, vomiting, aggravation of angina	Eclampsia
Adrenergic Inhibitors					
Labetalol hydrochloride	20–80 mg IV bolus every 10 min 0.5–2.0 mg/min IV infusion	5–10 min	3–6 hrs	Vomiting, scalp tingling, bronchoconstriction, dizziness, nausea, heart block, orthostatic hypotension	Most hypertensive emergencies except acute heart failure
Esmolol hydrochloride	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	1–2 min	10–30 min	Hypotension, nausea, asthma, first degree heart block, heart failure	Aortic dissection, perioperative
Phentolamine	5–15 mg IV bolus	1–2 min	10–30 min	Tachycardia, flushing, headache	Catecholamine excess

Let's Play a Game: Drug of Choice

- Disease
  - Acute aortic dissection
  - Acute congestive heart failure/pulmonary edema
  - Acute ischemic stroke, tPA candidate
  - Acute ischemic stroke, non-tPA candidate
  - Acute intracranial hemorrhage
  - Hypertensive encephalopathy
  - Cocaine toxicity
  - Delirium tremens
  - Preeclampsia/eclampsia
- Drug of choice
  - Nitroglycerin
  - Nitroprusside
  - Labetolol
  - Hydralazine
  - Fenodolpam
  - Esmolol
  - Phentolamine
  - Lasix
  - Nicardipine
  - None of the above

Outline

- Background
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Objectives

- Know how to evaluate someone who is hypertensive (which may mean doing nothing)
- Know how to distinguish between hypertensive emergencies and non-emergencies—and how to manage them
- Competently be able to appropriately disposition patients over the range of hypertension problems—from someone with an elevated blood pressure to hypertensive emergencies

Final Thoughts

- Goals in evaluation
  - Decide if someone has inaccurate measurement vs elevated blood pressure vs hypertension
  - Decide if someone has a hypertensive urgency vs. emergency
  - Decide if someone has *end organ dysfunction/damage*
- Not all elevated blood pressures are the same
  - Spectrum of disease
  - Not all hypertension requires testing
  - Not all hypertension requires lowering of blood pressure
  - Treatment of hypertensive emergencies is determined by the underlying pathophysiology of the disease process
- The disposition of patients with elevated blood pressures varies
  - Education vs. prescribing anti-hypertensives vs. follow up with PCP
- Questions/comments?