

## Pharmacologic Management of Hypertension

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## Objectives

- Identify the major differences in the 2014 Evidence-Based Guidelines for the Management of High Blood Pressure in Adults and the JNC-7 Guidelines.
- Define the concept of “compelling indications” in the choice of pharmacologic agents in the management of hypertension.
- Explain the physiologic alterations and target organ damage associated with high blood pressure.
- Identify best practice pharmacologic therapy for special populations with high blood pressure.

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## The Impact of Hypertension

- 78 million adults in the United States
  - 74.9% are being treated
  - 52.5% under control
  - 89.4% report a usual source of health care
- Projected to effect >1.5 billion people in the US by 2025
- Stroke (72%)
- Cardiovascular disease (46%)
- Direct and indirect cost estimated at 69.9 billion dollars

Darush et al. Heart Disease and Stroke Statistics-2014 Update: A Report from the American Heart Association, Circulation. 2014; 10.1161/01  
CDC. Vital Signs: Prevalence, Treatment and Control of Hypertension- United States 2003-2010. *MMWR Morbidity and Mortality Weekly Report*. 2012; 61: 703-709  
Heindrich et al., Forecasting the Future of Cardiovascular Disease in the United States: A Policy Statement from the American Heart Association. *Circulation*, 2011; 123:933-944

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**Case 1**

- A 74 y/o frail African American female, with a past history of dementia, SVT, and dyslipidemia presents to the clinic with a resting HR of 96 a BP of 168/96 and home BP readings ranging from 164-170/94–88. Which pharmacological agent would you start her on?

1. A diuretic (HCTZ)
2. An ACEI (Angiotensin-converting enzyme inhibitor)
3. A beta-blocker
4. A calcium channel blocker

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**Case 2**

- A 42 year old Hispanic female, newly diagnosed with Type II diabetes, presents with a BP of 140/94 and HBPM of 138–148/86–86. What medication would you chose to start the patient on?

1. A diuretic (HCTZ)
2. An ACEI or ARB
3. A Beta-blocker
4. A calcium channel blocker

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**Case 3**

- A 64 year old male patient, who has unsuccessfully tried lifestyle modification for 6 months, has a persistent BP reading of 148/90. Should he be started on medication to lower his blood pressure?

1. Yes
2. No

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## Causes of Hypertension

- **Primary** (essential) hypertension accounts for 95% of cases
- Constitutional risk factors for hypertension: family history, age-related factors, insulin resistance and metabolic abnormalities including diabetes, race
- Lifestyle risk factors: obesity, stress, sedentary lifestyle/inactivity
- **Secondary** hypertension accounts for 5-10% of cases
  - Sleep Apnea
  - Drugs: (OC, NSAIDs, decongestants, cocaine, amphetamines)
  - Chronic Kidney Disease
  - Primary aldosteronism
  - Renovascular disease
  - Chronic steroid use/ Cushing's syndrome
  - Thyroid or parathyroid disease
  - Pheochromocytoma
  - Coarctation of the aorta

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## Mechanism of Blood Pressure Control

- Short Term Blood Pressure Regulation:
  - Neural mechanisms: Integration and modulation of the ANS
  - Humoral mechanisms: renin-angiotensin-aldosterone mechanism and sympathetic neurotransmitter: epinephrine from the adrenal gland → vascular tone
- Long Term Blood Pressure Regulation: Kidney
  - Excess sympathetic nerve activity → alters arterial pressure to the kidney
  - Changes in neural or humoral control of kidney function alters the diuresis-natriuresis process to higher fluid pressure → arterial pressure ↑ peripheral vascular resistance
  - \*\* Many antihypertensive medications produce BP lowering by increasing Na<sup>+</sup> and water elimination

Grossman & Porth, Pathophysiology: Concepts of Altered Health States 9<sup>th</sup> Edition. Wolter's Kluwer, LWL, Philadelphia, 2014

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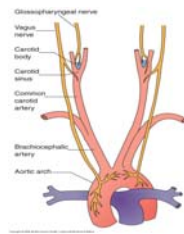
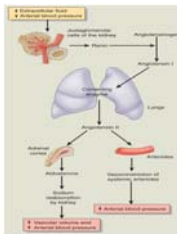
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## Mechanism of Blood Pressure Control

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Grossman & Porth, Pathophysiology: Concepts of Altered Health States 9<sup>th</sup> Edition. Wolter's Kluwer, LWL, Philadelphia, 2014

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### The Pathophysiology of Pre-Hypertension “Inflammation, Immunity and Hypertension”

- Pre-hypertension predicts the development of hypertension
- Innate Immunity: First defense against pathogens
- Adaptive Immunity: Very specific immunity
  - Activation of CD4 lymphocytes and T cells which travel to the site of inflammation
- Inflammation–Immunity–Hypertension:
- Even limited elevation of BP triggers this response
- \*\* Importance of lifestyle modification and early intervention
- \* Possible immunotherapy in the future to treat hypertension

Harrison, D., et al. Inflammation, Immunity and Hypertension. *Hypertension*. 2011;57: 132-140

### Impact of Prehypertension

- Association of prehypertension to mortality
- Meta-analysis of 20 studies/1,129,098 participants
- Conclusion
  - Significant increase in CVD mortality and especially stroke mortality, but not all-cause mortality
  - High range pre-hypertension risk
  - Higher in blacks than other ethnicities
- Recommendation
  - \* Prehypertension should be sub-classified
  - Low range prehypertension 120-129/80-84
  - High range prehypertension 130-139/85-89

Huang, et al., Association of All-cause and Cardiovascular Mortality With Prehypertension. *American Heart Journal*. 2014;167 (2): 160-168

### Evaluating Hypertension

- Average of 2 or more BP readings obtained from 2 or more office visits /HBP monitoring.
- Identify any underlying causes of hypertension.
- Assess for target-organ damage and CV disease.
- Evaluate lifestyle and identify factors that may affect the prognosis of guide treatments.
- AHA recommends HBPM or (SBPM).

Pickering, TG., Miller, NH, Oggedigbe, G. et al. Call to Action on Use and Reimbursement of Home Blood Pressure Monitoring. Executive Summary. A Joint Scientific Statement for the AHA, ASH and PCNA. *Hypertension*. 2008;52 ( 1): 1-9.

### Target Organ Damage

- Heart
  - Left ventricular hypertrophy
  - Angina or prior MI
  - Prior coronary revascularization (PCI or CABG)
  - Heart Failure
- Brain
  - Stroke or Transient ischemic attack
- Chronic kidney disease
- Peripheral arterial disease
- Retinopathy

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### Disparities in the Prevalence of Hypertension

- Higher in men up to 45 years of age
- 45-64 years of age, same incidence
- After age 65 higher for women
- Higher incidence among Black Americans (41% versus 28%)
- Asian Americans/Pacific Islanders
- Hispanics

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### Hispanics/Latinos and Hypertension

The Hispanic Community Health Study (HCHS/SOL)

- 16,415 US Hispanic/Latinos from Bronx, Chicago, Miami and San Diego
- Diverse Background:
- Ages 18-44, 45-64, 65-74
- Age 45 – 64: 40.3% men and 41.6% women had hypertension
- Age: 65-74: 72.4 men & 77.4% women had hypertension
- Highest among Cubans, Dominicans and Puerto Ricans and lowest among Mexicans and South Americans
- 51.5% of men and 31.3% women from 45 – 74 had sleep apnea
- \* Highest among the Cuban population and lowest among South American

NIH Publication 13-7951 Heart Lung and Blood Institute, Hispanic Community Health Study of Latinos (SOL). Sept, 2013.

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## Pharmacological Management of Hypertension

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### Angiotensin-Converting Enzyme (ACE) Inhibitors Angiotensin-II Receptor Blockers (ARBs)

- Critical drugs for hypertension management, HF, AMI
- ACE act on the critical enzyme that generates angiotensin II, preventing the conversion of angiotensin I to angiotensin II
- ARBs act on the major angiotensin II receptor that responds to Angiotensin II stimulation
- Both well tolerated
- Improves endothelial function in diabetes
- Renal protective
- \* contraindicated in pregnancy

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### Calcium Channel Blockers

- Act by selective inhibition of the L & T-channels of the vascular smooth muscle and myocardium
  - L “long acting channels”
  - T” transient channels”
- Less calcium is available for contraction
- **Dihydropyridines** (greater vascular selectivity versus myocardium)
- Nifedipine (Procardia XL, Adalat) (short acting), Amlodipine (Norvasc) (longer acting with arteriole dilation)
- **Non-Dihydropyridines** (AV nodal inhibition properties and relaxation of the coronary vascular smooth muscle)  
Verapamil (Calan), Diltiazem (Cardizem)
- \*\* Contra-indicated in HF
- Effective in African/Caribbean - American population

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### **$\beta$ -Blockers**

- Sympathetic nervous system blocking,  $\downarrow$ HR,  $\uparrow$  diastolic coronary blood filling time
- $\downarrow$  plasma renin
- Cause release of vasodilatory prostaglandins
- Cardio-selective: Metoprolol, Atenolol, Bisoprolol
- Combined  $\alpha$  &  $\beta$ -Blockers: Labetalol and Carvedilol
- Found to be effective in the black population after CCBs

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### **Selective $\alpha$ -Adrenergic Antagonists**

- Selectively block  $\alpha$ -1 receptors in arterioles and venules
- More effective when used with a diuretic &  $\beta$ -blocker
- Doxazosin (Cardura), Prazosin (Minipress), Trazosin (Hytrin)
- \* Orthostatic hypotension

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### **Diuretic Therapy**

- Continue as first line drug per guidelines
  - Thiazides, Loop diuretics, K-sparing, Aldosterone receptor blockers
- Thiazide diuretics work best in hypertension
- Low dose HCTZ significantly reduces CV mortality, HF and Stroke
- \* work best in combination therapy with ACEI, ARRB, CCB

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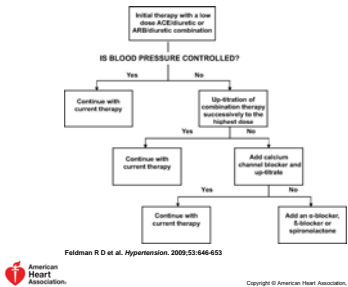
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**The STITCH Hypertension Algorithm**  
**(Simplified Treatment Intervention to Control Hypertension)**

- Begins with low dose of diuretic/ACEI or ARB fixed dose combination
- Low-dose combination therapy more effective than low-dose monotherapy
- Incidence of adverse effects less (similar to placebo)
- Fixed dosing improves adherence
- **Results**
  - STITCH 64.7% reached target versus guideline care 52.7%
  - Medication adherence (via drug logs) higher in fixed dosing
  - STITCH algorithm included initial dosing with fixed dosing combination therapy
  - MD satisfaction increased in fixed dosing combination and greater drug titration in fixed dosing combination

Feldman, R et al. A Simplified Approach to the Treatment of Uncomplicated Hypertension: A Cluster Randomized Controlled Trial. *Hypertension*. 2009; 53:646-653.

Figure 2. STITCH-care algorithm.



**DRUG TITRATION STRATEGIES**

Table 5. Strategies to Dose Antihypertensive Drugs

Strategy	Description	Details
A	Start one drug, titrate to maximum dose, and then add a second drug	If goal BP is not achieved with the initial drug, titrate the dose of the initial drug up to the maximum recommended dose to achieve goal BP. If goal BP is not achieved with the use of one drug despite titration to the maximum recommended dose, add a second drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB) and titrate up to the maximum recommended dose of the second drug to achieve goal BP. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose to achieve goal BP.
B	Start one drug and then add a second drug before achieving maximum dose of the initial drug	Start with one drug then add a second drug before achieving the maximum recommended dose of the initial drug, then titrate both drugs up to the maximum recommended doses of both to achieve goal BP. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose to achieve goal BP.
C	Begin with 2 drugs at the same time, either as 2 separate pills or as a single pill combination	Initiate therapy with 2 drugs simultaneously, either as 2 separate drugs or as a single pill combination. Some committee members recommend starting therapy with 2 drugs when SBP is $\geq 160$ mm Hg and/or DBP is $\geq 100$ mm Hg, or if SBP is $\geq 20$ mm Hg above goal and/or DBP is $\geq 10$ mm Hg above goal. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose.

James, P. et al. *JAMA*. Published online December 18, 2013



### **Lifestyle Interventions to Reduce Blood Pressure**

- Weight loss
- Salt reduction
- Adoption of Dietary Approaches to Stop Hypertension eating pattern (DASH)
- Aerobic exercise for 30 minutes daily
- Alcohol in moderation

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### **OTC and Supplements Enhancing Hypertension**

- Nonsteroidal anti-inflammatory agents or COX-2 inhibitors
- Sympathomimetics (decongestants, diet pills, cocaine)
- Stimulants (amphetamines, methamphetamine)
- Oral contraceptives or hormone replacement agents
- Some antidepressants
- Dietary supplements (ginseng, ephedra, ma huang, bitter orange)
- Natural licorice

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### **Looking at Special Populations**

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### Patients with Hypertension and CVD

- Stable angina
  - Historically a Beta-blocker has been the drug of choice
  - Calcium channel blockers also found to be beneficial
- Chronic stable angina
  - Can use Beta-blocker + calcium channel blockers (dihydropyridine CCBs drug of choice amlodipine, nifedipine)
- Unstable angina or MI
  - Beta-blocker and/or ACE initially with addition of others (nitrates, antianginals) added as needed
- Heart Failure
  - Beta-blockers + (ACE or ARB) + aldosterone antagonist with systolic HF and EF < 35%

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### Patients with Hypertension and Diabetes

- Control of HBP key goal for diabetics to ↓CVD risk
- ADA guidelines (2013) goal BP <140/80 with ACEI or ARB
- ADA guidelines (2013) Younger diabetics systolic target <130mm Hg
- JNC 8 guidelines (2013) goal BP <140/90 with ACEI or ARB
- UKPDS reduction in BP (mean 154/87 to 144/82) → significant reduction in diabetes complications and CVD deaths.
  - No difference between ACEI and Beta-blockers however Beta-blockers better tolerated.

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### Management of Patients with Hypertension and Diabetes continued

- ACEI & ARB reduce progression of diabetic nephropathy and reduce albuminuria in pts. with diabetic hypertension
- Serum creatine, glomerular filtration rate (eGFR) and K<sup>+</sup> monitored
- \* Caution with Beta-blockers in insulin dependent diabetes and hypoglycemia
- ADA: Pregnant patients with diabetes and chronic hypertension, BP targets 110-129/65-79 mm HG
- ACEI and ARBs contraindicated in pregnancy

Executive Summary: Standards of Medical Care in Diabetes-2014. Diabetes Care. Vol. 37, Supplement 1, January 2014.

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## Hypertension in African Americans

- Heart disease, stroke, diabetes and ESRD highest in African Americans.
- Occurs earlier, is more severe with significant target-organ damage
- Some studies show AA lower levels of renin which results in excess salt and fluid.
- Also SNS over activity and abnormalities in endothelium – dependent vasodilation and ↑ large artery stiffening
- JNC8 (2013) Goal of <140/90 (recommends thiazide-type diuretic and/or CCB alone or in combination)
- ISHIB (2010) Goal of < 135/85 (Diuretic or CCB)

James, et al. 2014 Evidence Based Guidelines for the Management of High Blood Pressure in Adults. Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). JAMA 2014;310:585-592. doi:10.1001/jama.2013.284427

Flack et al. 2010. International Society on Hypertension in Blacks: Management of High Blood Pressure in Blacks: an Update. Hypertension. 56(5):780 – 800.

## Hypertension and the Elderly

- 2/3 persons over age 65 have HBP & 70% adults ≥75 yrs of age
- More common in women
- Many with multiple co-morbidities = high risk
- Postural hypotension significant issue in elderly:
  - BP should be measured sitting and standing
- LV diastolic dysfunction + systemic impedance (arterial stiffness)
  - ↑ HBP and HF
- After age 70 isolated systolic hypertension (ISH) common (>90% patients with HBP) with high peak systolic and low diastolic pressure
- Sodium restriction often very effective in elderly

Fleg, L., et al. Secondary Prevention of Atherosclerotic Cardiovascular Disease in Older Adults: A Scientific Statement From the American Heart Association. Circulation. 2013; 128:155N-0009-7322

## Hypertension Management in the Elderly Continued

- Lifestyle modification effective for mild hypertension, **HOWEVER** > age 75 data minimal
- CCBs good especially with stroke reduction
- Beta-blockers and diuretics often not tolerated
  - Low dose and slow up-titration
- ACEI and ARBS well tolerated
- Slow titration (absorption, metabolism and excretion lower)
- 2/3 seniors **WILL** require ≥ 2 drugs

## Hypertension Management in the Elderly Continued

- Common side effects of antihypertensives in the elderly
  - **B-Blockers:** confusion, fatigue, dizziness, chronotropic incompetence, claudication, depression, cold sensitivity, incontinence
  - **Calcium channel blockers:** dizziness, peripheral edema (dihydropyridines) constipation (Verapamil), CHF decompensation, conduction disease: bradycardia, heart block
  - **ACEI:** orthostatic hypotension, hyperkalemia, fatigue and cough
  - **Diuretics:** urinary frequency, ↑ incontinence, hyperuricemia, hyperglycemia (diabetics), muscle cramps, ↑ electrolyte imbalance
- JNC 8 Age ≥ 60 150/90

Fig. L, et al. Secondary Prevention of Atherosclerotic Cardiovascular Disease in Older Adults: A Scientific Statement From the American Heart Association. *Circulation*. 2013; 128 ISSN:0009-7322  
James, P et al., 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). *JAMA* 2014 DOI 10.1001/jama.2013.284427.

## Hypertension in Pregnancy

- Hypertension complicates 1:10 pregnancies
- Critical to distinguish between preexisting (chronic) from pregnancy induced (gestational hypertension) and the syndrome of preeclampsia.
- Classified as “mild” 140 -159/90 – 109 or “severe” ≥ 160/110 mm Hg.
- Goals:
  - To prolong pregnancy as long as safely possible
  - Maximize the gestational age of the infant
  - Minimize fetal exposure to medications
- \*\* Challenge is when to start antihypertensive medications and what BP target

Podymow T & August P, Update on the Use of Antihypertensive Drugs in Pregnancy. *Hypertension*. 2008; 51: 960 - 969

## Hypertensive Disorders in Pregnancy

continued

- **Chronic hypertension:** BP> 140/90 mm Hg, predating pregnancy or before 20 weeks gestation
  - 25% incidence of developing preeclampsia
- **Pre-eclampsia-eclampsia:** new onset hypertension in later pregnancy
  - Also has proteinuria 1+ and greater then ≥ 300 mg per 24 hr urine collection
  - Multiorgan clinical features: hypertension, proteinuria, cerebral edema, hepatic dysfunction (↑ LFTS and low platelets)
  - \* lowering systemic BP further decreases placental perfusion does not “cure” the syndrome
  - \* need to prevent major cardiac and neurologic disaster
  - \*Fetal risk is growth restriction and prematurity

## Hypertensive Disorders in Pregnancy

continued

- **Gestational hypertension:** hypertension in later pregnancy without systemic features of preeclampsia
- At risk for preeclampsia anytime and 1-2 weeks postpartum
- Pharmaceutical Agents:
  - Methyldopa – first line (centrally  $\alpha_2$ -adrenergic agonist)
  - Labetalol – second line (nonselective  $\beta$ -blocker)
  - Nifedipine – second line
- Severe hypertension in pregnancy is  $> 160/110$ .
- \* important to avoid hypotension  $\rightarrow \downarrow$  placental blood flow

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## Obstructive Sleep Apnea (OSA) and Hypertension

- Strong risk factor for resistant hypertension
- Benefit noted in pre-hypertension
- \* Not as first-line therapy to pharmacology but adjunctive
- Meta analysis of trials: reduction of systolic BP 2.5 mm Hg and 1.8 diastolic BP with CPAP
- CPAP particularly beneficial for resistant hypertension
- Beneficial in pre-hypertension

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## Alternative Therapies for Blood Pressure Control

- Often trial offered to avoid or delay pharmacological therapy
- Combination of therapies found to be helpful with resistant hypertension
- In general little or no side effects or health risks especially for medication intolerant individuals
- **Behavioral Interventions:** \* Limited testing of strategies reporting majorly "observational"
- **Exercise Interventions:** Dynamic aerobic exercise & Resistance exercise \* Strong evidence of benefit and BP lowering
- **Nutritional Interventions:** co-enzyme Q10, fish oil, L-arginine, alpha lipoic acid, polyphenols and Vit D
- **Device Intervention:** Renal Denervation

Brook, R.D., Appel, L., Rubenstein, M., et al., Alternative Approaches to Lowering Blood Pressure: A Scientific Statement from the American Heart Association. *Hypertension* 2013;61 (6): 1360 -1363.

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**Behavioral Therapies and BP Lowering  
HRQ (Healthcare Research and Quality Review)**

- Meditation techniques: Zen, Transcendental Meditation (TM), Mindfulness Based Stress Reduction (MBSR)
- Biofeedback Techniques: behavioral therapy, relaxation therapy, guided imagery
- Yoga
- Audio Relaxation Programs (Mozart)
- Acupuncture
- Slow deep breathing with device monitoring

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**The Guideline Controversy**

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**Background Information JNC  
Joint National Committee on Prevention, Detection, Evaluation,  
and Treatment of High Blood Pressure**

- JNC 1 1976 – JNC 7 2003
- JNC 8 organized in 2008 with review submitted 6/2013
- Submitted for review to 16 federal agencies & 20 individual reviewers
- NHLBI subsequently decided AHA/ACC should make future guidelines
- JNC8: based on 2011 Institute of Medicine guidelines recommendations
- Systematic review of RCTs only

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**JNC 7 BLOOD Pressure Classification**

	SBP mm Hg		DBP mm Hg
<b>Normal</b>	<b>&lt;120</b>	<b>and</b>	<b>&lt;80</b>
<b>Prehypertension</b>	<b>120-139</b>	<b>or</b>	<b>80-89</b>
<b>Stage 1 Hypertension</b>	<b>140-159</b>	<b>or</b>	<b>90-99</b>
<b>Stage 2 Hypertension</b>	<b>≥ 160</b>	<b>or</b>	<b>≥100</b>

JNC 7. JAMA. 2003;289:2560-2572

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**JNC 7: Compelling Indications for Individual Drug Classes**

High-Risk Condition With Compelling Indication*	Recommended Drugs					
	Diuretic	Beta-Blocker	ACE Inhibitor	ARB	CCB	Aldo Ant
Heart failure	x	x	x	x		x
Post-MI		x	x			x
High CAD risk	x	x	x		x	
Diabetes	x	x	x	x	x	
Chronic kidney disease			x	x		
Recurrent stroke prevention	x		x			

MI = myocardial infarction; CAD=coronary artery disease; Aldo Ant = aldosterone antagonist.

\*Based on benefits from outcome studies or existing guidelines, the compelling indication is managed in parallel with the BP.

JNC 7. JAMA. 2003;289:2560-2572.

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**Guideline Questions JNC 8**

- 1) Does initiating antihypertensive treatment at specific BP thresholds improve health outcomes?
- 2) Does treatment with antihypertensive therapy to a specific BP goal improved health outcomes?
- 3) Are there differences in benefit/harm between antihypertensive drugs or drug classes on specific health outcomes?

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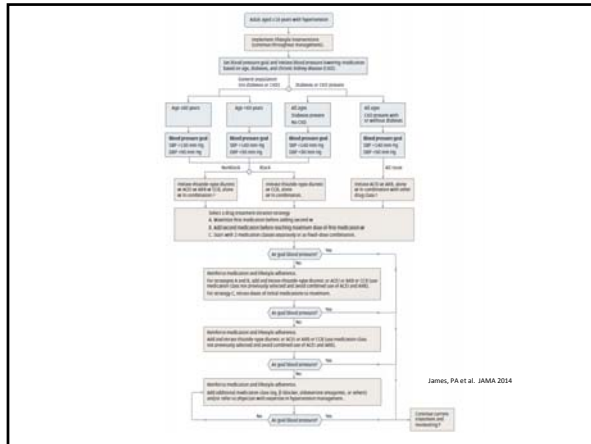
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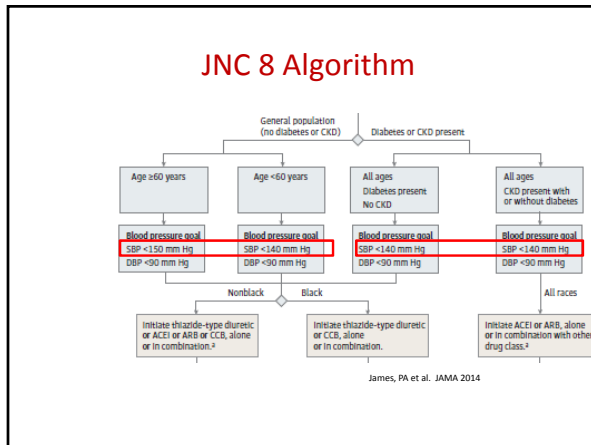
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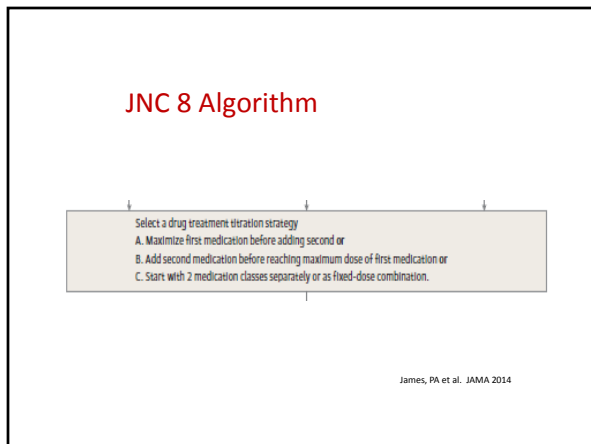
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### WHAT'S NEXT?

- At the request of the NHLBI, the AHA and the ACC are in the planning stages of creating a collaborative, comprehensive, evidence-based guideline on the treatment of hypertension.
- This guideline will be the fifth in the series set of CVD prevention guidelines supported by systematic evidence reviews from the NHLBI.
- Major hypertension and primary care physician specialty societies have been invited to participate as full partners with the AHA and ACC in the creation of this future comprehensive hypertension guideline.

M Jessup and JG Herold, Hypertension, 2-4-2014.

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### Tackling the Epidemic of Hypertension

- A multifactorial approach
  - Patients, families, providers, healthcare delivery systems and communities
  - Patient and provider awareness, access to care, lifestyle modification, evidence – based treatment, medication adherence
- AHA primary focus area of the 2014-2017 strategic plan
- Million Hearts (UDHHS, CDC & CMS) first 2 years action plan focuses on control of hypertension
- Eliminating current disparities
- Impacting change for the individual and the community

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### Case 1

- A 74 y/o frail African American female, with a past history of dementia, SVT, and dyslipidemia presents to the clinic with a resting HR of 96 a BP of 168/96 and home BP readings ranging from 164-170/94-88.  
Which pharmacological agent would you start her on?
1. A diuretic (HCTZ)
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  3. A beta-blocker
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## Case 2

- A 42 year old Hispanic female, newly diagnosed with Type II diabetes, presents with a BP of 140/94 and HBPM of 138–148/86–86. What medication would you chose to start the patient on?

1. A diuretic (HCTZ)
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4. A calcium channel blocker

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## Case 3

- A 64 year old male patient, who has unsuccessfully tried lifestyle modification for 6 months, has a persistent BP reading of 148/90. Should he be started on medication to lower his blood pressure?

1. Yes
2. No

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