Treatment of Hypertension: A Case-Based Approach

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Associate Professor of Clinical Medicine
Columbia University
Prevalence of Hypertension in the US

Based on NHANES III (phase 1 and 2)
Hypertension defined as blood pressure $\geq 140/90$ mmHg or treatment


25% of the US adult population = 43,186,000
Blood Pressure Classification

<table>
<thead>
<tr>
<th>BP CLASSIFICATION</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<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>
</tr>
<tr>
<td>Stage 1 HTN</td>
<td>140-159 or</td>
<td>90-99</td>
</tr>
<tr>
<td>Stage 2 HTN</td>
<td>&gt;160</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>
Effect of Antihypertensive Therapy on CV Events

Percent decrease in events vs placebo

-52 CHF
-38 Fatal/nonfatal strokes
-35 LVH
-21 CVD deaths
-16 Fatal/nonfatal CHD events

17 randomized, placebo-controlled trials using diuretic or β-blocker (n=48,000)

All reductions are statistically significant

Hypertension Therapy

Lifestyle

Drugs

Co-existent disease

Cost

Side Effects
A 45-year-old African-American male is noted to have a BP of 170/100 on a routine physical exam.
He smokes 1 pack/day, has a 50-year old brother who died of an M.I., but is otherwise healthy.
Physical examination, labs and EKG are all normal.
TCHOL 240, HDL 30

Next Step?
Initial Evaluation

- Confirm diagnosis (Repeat readings, home BP, ABP)
- Secondary causes?
- Estimate CV risk status
- Assess Target Organ Damage
- Co-morbid conditions
“Secondary” Hypertension

- Difficult to control
- Sudden onset of HTN
- Well controlled-> difficult to control
- Severe hypertension
- History/physical/laboratory indicates a secondary cause
Screening for Secondary HTN

- Renal parenchymal disease
  - Urine Analysis, urine protein/creatinine, serum creatinine, Ultrasound.
- Renovascular
  - Captopril scan
- Coarctation
  - Lower Extremity BP
- Primary aldosteronism
  - Serum and urinary K
  - Plasma aldosterone/renin ratio
- Pheochromocytoma
  - Plasma metanephrine, or 24h urine catecholamines, metanephrine
Estimate Risk Status

- Hypertension
- Smoking
- Obesity (BMI > 30kg/m²)
- Dyslipidemia
- Diabetes
- Age > 55 (men), 65 (women)
- Family history of CVD
  (Men < 55, Women < 65)

- Metabolic Syndrome
Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization


Go AS.. NEJM, 351:1296-1305, 2004
What is his 10-year risk profile?

<table>
<thead>
<tr>
<th>Risk score results:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td>45</td>
</tr>
<tr>
<td>Gender:</td>
<td>male</td>
</tr>
<tr>
<td>Total Cholesterol:</td>
<td>240 mg/dL</td>
</tr>
<tr>
<td>HDL Cholesterol:</td>
<td>30 mg/dL</td>
</tr>
<tr>
<td>Smoker:</td>
<td>Yes</td>
</tr>
<tr>
<td>Systolic Blood Pressure:</td>
<td>170 mm/Hg</td>
</tr>
<tr>
<td>On medication for HBP:</td>
<td>No</td>
</tr>
</tbody>
</table>

**Risk Score**

- The risk score shown was derived on the basis of an equation. Other NCEP materials, such as ATP III print products, use a point-based system to calculate a risk score that approximates the equation-based one.

To interpret the risk score and for specific information about CHD risk assessment as part of detection, evaluation, and treatment of high blood cholesterol, see [ATP III Executive Summary](#) and [ATP III At-a-Glance](#).
10 year risk reduction....

<table>
<thead>
<tr>
<th>Risk score results:</th>
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<tbody>
<tr>
<td>Age:</td>
<td>45</td>
</tr>
<tr>
<td>Gender:</td>
<td>male</td>
</tr>
<tr>
<td>Total Cholesterol:</td>
<td>200 mg/dL</td>
</tr>
<tr>
<td>HDL Cholesterol:</td>
<td>40 mg/dL</td>
</tr>
<tr>
<td>Smoker:</td>
<td>No</td>
</tr>
<tr>
<td>Systolic Blood Pressure:</td>
<td>140 mm/Hg</td>
</tr>
<tr>
<td>On medication for HBP:</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Risk Score</strong>*</td>
<td>4%</td>
</tr>
</tbody>
</table>

* The risk score shown was derived on the basis of an equation. Other NCEP materials, such as ATP III print products, use a point-based system to calculate a risk score that approximates the equation-based one.

To interpret the risk score and for specific information about CHD risk assessment as part of detection, evaluation, and treatment of high blood cholesterol, see [ATP III Executive Summary](#) and [ATP III At-a-Glance](#).
Albuminuria and Risk of Cardiovascular Events, Death, and Heart Failure in Diabetic and Nondiabetic Individuals

For every 0.4-mg/ mmol increase in ACR level, CV events increased by 5.9%

- Age ≥55 years
- History of CV disease (n = 5545)
- DM and at least 1 CV risk factor (n = 3498)

*Gerstein, H. JAMA 286 :421–426, 2001*
Assess Target Organ Damage

- **Heart Disease**
  - CAD (Angina, myocardial infarction, coronary revascularization)
  - *Left Ventricular Hypertrophy*
  - Heart Failure

- **Stroke/TIA**

- **Chronic kidney disease**

- **Peripheral arterial disease**

- **Retinopathy**
Laboratory Tests in Uncomplicated HTN

- ECG, Limited Echo
- Urine analysis
- Blood glucose, hematocrit
- Basic metabolic panel
- Lipid profile after 9-12 hour fast
- Urine microalbumin
## Blood Pressure Targets

<table>
<thead>
<tr>
<th>Clinical Status</th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension (no diabetes or renal disease)</td>
<td>&lt;140/90 mmHg (JNC 7)</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>&lt;130/80 mmHg (ADA, JNC 7)</td>
</tr>
<tr>
<td>Renal Disease with proteinuria &gt;1 gram/24 hours, or diabetic kidney disease</td>
<td>&lt;130/80 mmHg &lt;125/75 mmHg (NKF)</td>
</tr>
</tbody>
</table>

## Lifestyle Modification

<table>
<thead>
<tr>
<th>Modification</th>
<th>Approximate SBP reduction (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>5–20 mmHg/10 kg weight loss</td>
</tr>
<tr>
<td>Adopt DASH eating plan</td>
<td>8–14 mmHg</td>
</tr>
<tr>
<td>Dietary sodium reduction</td>
<td>2–8 mmHg</td>
</tr>
<tr>
<td>Physical activity</td>
<td>4–9 mmHg</td>
</tr>
<tr>
<td>Moderation of alcohol consumption</td>
<td>2–4 mmHg</td>
</tr>
</tbody>
</table>
"Yes! I exercise daily... Yes! I've cut down on fatty foods... Yes! I watch my salt intake... Now let me ask you a question... Do you?"
Drugs for Hypertension

- Diuretics
  - Thiazide
  - Loop diuretics
  - Aldosterone antagonists
  - K-sparing

- Adrenergic inhibitors
  - Peripheral agents
  - Central (α-agonists)
  - alpha-blockers*
  - beta-blockers
  - Alpha+beta-blockers

- Direct Vasodilators *
- Calcium channel blockers
  - Dihydropyridine
  - Non dihydropyridine

- ACE-inhibitors
- Angiotensin-II blockers
- Renin Inhibitors

* Usually not monotherapy
Algorithm for Treatment of Hypertension

Lifestyle Modifications

Not at Goal Blood Pressure (<140/90 mmHg) (<130/80 mmHg for those with diabetes or chronic kidney disease)

Initial Drug Choices

Without Compelling Indications
- **Stage 1 Hypertension** (SBP 140–159 or DBP 90–99 mmHg)
  - Thiazide-type diuretics for most.
  - May consider ACEI, ARB, BB, CCB, or combination.

With Compelling Indications
- **Stage 2 Hypertension** (SBP ≥160 or DBP ≥100 mmHg)
  - 2-drug combination for most (usually thiazide-type diuretic and ACEI, or ARB, or BB, or CCB)
- Drug(s) for the compelling indications
  - Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed.

Not at Goal Blood Pressure

Optimize dosages or add additional drugs until goal blood pressure is achieved.
Consider consultation with hypertension specialist.
ALLHAT

Primary Outcome by Treatment Group

Cumulative Fatal CHD and Nonfatal MI event rate (%)

Chlorthalidone
Amlodipine
Lisinopril

Time to event, yrs

0 1 2 3 4 5 6 7

Copyright ©2002, American Medical Association.
Hydrochlorothiazide vs. Chlorthalidone
PK Profiles

<table>
<thead>
<tr>
<th>Drug</th>
<th>Onset, h</th>
<th>Peak, h</th>
<th>Half-Life, h</th>
<th>Duration, h</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCTZ</td>
<td>2</td>
<td>4–6</td>
<td>6–9 (Single dose)</td>
<td>12 (Single dose)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8–15 (Long-term dosing)</td>
<td>16–24 (Long-term dosing)</td>
</tr>
<tr>
<td>Chlorthalidone</td>
<td>2–3</td>
<td>2–6</td>
<td>40 (Single dose)</td>
<td>24–48 (Single dose)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45–60 (Long-term dosing)</td>
<td>48–72 (Long-term dosing)</td>
</tr>
</tbody>
</table>

Hydrochlorothiazide vs. Chlorthalidone
Ambulatory Blood Pressure

Ernst.. Hypertension. 2006;47:352
Hydrochlorothiazide vs. Chlorthalidone
Office Blood Pressure

![Graph showing blood pressure changes over time for HCTZ and Chlorthalidone]

- **HCTZ (n=16)**
- **Chlorthalidone (n=14)**

<table>
<thead>
<tr>
<th>Week</th>
<th>HCTZ Δ</th>
<th>Chlor Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-4.5±2.1</td>
<td>-15.7±2.2</td>
</tr>
<tr>
<td>4</td>
<td>-7.6±2.8</td>
<td>-17.4±2.9</td>
</tr>
<tr>
<td>6</td>
<td>-9.3±3.2</td>
<td>-19.6±3.4</td>
</tr>
<tr>
<td>8</td>
<td>-10.8±3.5</td>
<td>-17.1±3.7</td>
</tr>
</tbody>
</table>

*P-values reported are Bonferroni adjusted p-values (unadjusted p-value X 4 tests)
Hypertension in the Very Elderly Trial (HYVET)

Indapamide 1.5mg + perindopril 2-4mg vs. Placebo

Hypertension in the Very Elderly Trial (HYVET)

A. Fatal or Nonfatal Stroke

No. at Risk
Placebo group 1912 1484 807 374 194
Active-treatment group 1933 1557 873 417 229

B. Death from Any Cause

No. at Risk
Placebo group 1912 1492 814 379 202
Active-treatment group 1933 1565 877 420 231

C. Death from Cardiovascular Causes

No. at Risk
Placebo group 1912 1492 814 379 202
Active-treatment group 1933 1565 877 420 231

D. Death from Stroke

No. at Risk
Placebo group 1912 1492 814 379 202
Active-treatment group 1933 1565 877 420 231
Beta Blockers as Initial Therapy

- The available evidence does not support the use of beta-blockers as first-line drugs in the treatment of hypertension.
- This conclusion is based on the relatively weak effect of beta-blockers to reduce stroke and the absence of an effect on coronary heart disease when compared to placebo or no treatment.
- More importantly, it is based on the trend towards worse outcomes in comparison with calcium-channel blockers, renin-angiotensin system inhibitors, and thiazide diuretics.
- Most of the evidence for these conclusions comes from trials where atenolol was the beta-blocker used (75% of beta-blocker participants in this review).
- However, it is not known at present whether beta-blockers have differential effects on younger and elderly patients or whether there are differences between the different sub-types of beta-blockers.

Cochrane Database Syst Rev. 2007 Jan 24;(1):CD002003
Hypertension Cases

Compelling Indications

Special populations
HTN in a Patient with Acute Cerebrovascular Accident

A 55 year old patient with history of HTN (controlled with nifedipine 10mg tid) is admitted with slurred speech. BP is 190/100 and she has R hemiparesis. ECG shows mild LVH. She is not a candidate for thrombolysis. ECHO shows an LVH but no source of embolus.

How will you manage her hypertension?
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Brain infarction (n = 1004)</th>
<th>Brain hemorrhage (n = 1097)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>70.4 (13.1)</td>
<td>64.3 (15.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>162.1 (31.1)</td>
<td>181.6 (34.6)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>88.2 (17.0)</td>
<td>99.2 (19.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Mean blood pressure (mmHg)</td>
<td>112.9 (19.6)</td>
<td>126.7 (22.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Men (%)</td>
<td>56.0</td>
<td>53.5</td>
<td>0.257</td>
</tr>
<tr>
<td>Conscious (alert) (%)</td>
<td>59.0</td>
<td>34.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>First-ever stroke (%)</td>
<td>78.5</td>
<td>86.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Death (%)</td>
<td>9.8</td>
<td>18.9</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Values presented as mean (standard deviation) or percentage.
Cosmo: Brain Hemorrhage

Cosmo: Brain Infarction

- Graph showing the relationship between systolic blood pressure (mmHg) and mortality rate (%)
- Mortality rate decreases as systolic blood pressure increases.
Pending more data, the consensus of the panel is that emergency administration of antihypertensive agents should be withheld unless

- diastolic blood pressure is >120 mm Hg or
- systolic blood pressure is >220 mm Hg.
Hypertension in Acute Ischemic Stroke:
Eligible for treatment with r-tPA or other acute reperfusion intervention

- Blood pressure level Systolic >185/110 mm Hg
  - Labetalol 10 to 20 mg IV over 1 to 2 minutes, may repeat;
    or
  - Nitropaste 1 to 2 inches;
    or
  - Nicardipine infusion, 5 mg/h, titrate up by 2.5 mg/h at 5- to 15-minute intervals, maximum dose 15 mg/h; when desired blood pressure attained, reduce to 3 mg/h

- If blood pressure does not decline and remains >185/110 mm Hg, do not administer rtPA

Lowering of blood pressure ~15 percent during the first 24 hours after stroke onset is suggested
A 40 year old previously healthy male is brought to the E.R. with 3 days of progressive shortness of breath and has experienced blurred vision in both eyes.

**Physical exam:**

Blood pressure 230/140. Lethargic.

Eye exam:

Chest: Bibasilar crackles  Cardiac: S1S2S4

Neuro: Bilateral upgoing plantars: Extr: 2+ edema

**Labs:** K=3.4, BUN=35, Creatinine: 2.2

CXR:  

Urine: 10-15 red cells, 2+ albumin.
Hypertensive Urgencies and Emergencies

- **HYPERTENSION EMERGENCIES**
  - Require immediate blood pressure reduction (not necessarily to normal range) to prevent or limit target organ damage.

- **HYPERTENSION URGENCIES**
  - Require reduction of blood pressure within a few hours
Emergencies & Urgencies

- **HYPERTENSIVE EMERGENCIES**
  - Require immediate blood pressure reduction (not necessarily to normal range) to prevent or limit target organ damage.

- **HYPERTENSIVE URGENCIES**
  - Require reduction of blood pressure within a few hours
Parenteral Drugs For Treatment of Hypertensive Emergencies

**VASODILATORS**
- Nitroprusside
- Fenoldopam
- Nitroglycerine
- Enalaprilat
- Nicardipine
- Hydralazine

**ADRENERGIC INHIBITORS**
- Labetalol
- Esmolol
- Phentolamine
Malignant Hypertension: Goal of Therapy

- The initial aim of treatment in hypertensive crises is to rapidly lower the diastolic pressure to about 100 to 105 mmHg
- This goal should be achieved within two to six hours
- Maximum initial fall in BP <25 % of the presenting value
Pregnancy and Hypertension

A 24 year old primiparous woman is seen in the obstetric clinic at 30 week gestation.

BP: 160/100, 2 + pedal edema
Otherwise unremarkable physical exam.
Urine shows 1000 mg of protein.
Other labs: N

After 2 days of bed rest BP remains 160-170/100
# Classification of Hypertension in Pregnancy

| CHRONIC HYPERTENSION | • BP ≥ 140/90 prior to pregnancy or before 20 weeks gestation  
<table>
<thead>
<tr>
<th></th>
<th>• Persists &gt;12 weeks postpartum</th>
</tr>
</thead>
</table>
| PREECLAMPSIA          | • BP ≥ 140/90 with proteinuria (>300 mg/24 hr) after 20 weeks gestation  
|                       |   • Can progress to eclampsia (seizures)  
|                       |   • More common in nulliparous women, multiple gestation, women with hypertension for ≥ 4 years, family history of preeclampsia, hypertension in previous pregnancy, renal disease |
| CHRONIC HYPERTENSION WITH SUPERIMPOSED PREECLAMPSIA | • New onset after 20 weeks in a woman with hypertension  
|                                                        |   • In a woman with hypertension and proteinuria prior to 20 weeks gestation:  
|                                                        |     • Sudden 2- to 3-fold increase in proteinuria  
|                                                        |     • Sudden increase in BP  
|                                                        |     • Thrombocytopenia  
|                                                        |     • Elevated AST or ALT |
## Classification of Hypertension in Pregnancy

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gestational Hypertension</strong></td>
<td>● Hypertension without proteinuria occurring after 20 weeks’ gestation&lt;br&gt;● Temporary diagnosis (only during pregnancy)&lt;br&gt;● May represent pre-proteinuric phase of preeclampsia or recurrence of chronic hypertension abated in midpregnancy&lt;br&gt;● May evolve to preeclampsia&lt;br&gt;● If severe, may result in higher rates of premature delivery and growth retardation than mild preeclampsia</td>
</tr>
<tr>
<td><strong>Transient Hypertension</strong></td>
<td>● Retrospective diagnosis (only after pregnancy)&lt;br&gt;● BP normal by 12 weeks postpartum&lt;br&gt;● May recur in subsequent pregnancies&lt;br&gt;● Predictive of future essential hypertension</td>
</tr>
</tbody>
</table>
Target BP

- There is no consensus as to the optimal blood pressure threshold for initiating therapy.

- Initiate therapy
  - Systolic pressures between 150 and 160 mm Hg and diastolic blood pressures between 100 and 105 mm Hg.
  - Earlier initiation with symptoms (eg, headache, visual disturbances, chest discomfort) and younger women whose baseline blood pressure was low (less than 90/75 mmHg).

- Target blood pressures are 130 to 150 mm Hg systolic and 80 to 100 mm Hg diastolic.
# Acute Treatment Of Hypertension In Pregnancy

<table>
<thead>
<tr>
<th>AGENT</th>
<th>DOSAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labetalol</td>
<td>20 mg iv bolus, repeat 10 minute intervals by doses of 20 to 80 mg (maximum 300 mg)</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>5 mg IV over 1-2minutes; if the blood pressure goal is not achieved within 20 minutes, give a 5 to 10 mg bolus depending upon the initial response. The maximum bolus dose is 20 mg</td>
</tr>
<tr>
<td>(Nifedipine)</td>
<td>Discouraged Short acting nifedipine is not approved by FDA for managing hypertension</td>
</tr>
<tr>
<td>Sodium nitroprusside</td>
<td>Last resort</td>
</tr>
</tbody>
</table>

Phyllis August, MD, MPH. Management of hypertension in pregnancy In: UpToDate, Rose, BD (Ed), UpToDate, Waltham, MA, 2007.
### Oral Treatment Of Hypertension In Pregnancy

<table>
<thead>
<tr>
<th>AGENT</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labetalol</td>
<td>Most widely used</td>
</tr>
<tr>
<td>Metyldopa</td>
<td>long-term safety for the fetus</td>
</tr>
<tr>
<td>Beta Blockers</td>
<td>Controversial: IUGR, fetal bradycardia.</td>
</tr>
<tr>
<td>Clonidine</td>
<td>Limited data</td>
</tr>
<tr>
<td>Calcium Channel Blockers</td>
<td>Most experience with nifedipine. Diltiazem and verapamil has also been used</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Avoid volume depletion</td>
</tr>
<tr>
<td>ACE-i/ARB</td>
<td>Contraindicated, reports of fetal toxicity and death</td>
</tr>
</tbody>
</table>

Phyllis August, MD, MPH. Management of hypertension in pregnancy In: UpToDate, Rose, BD (Ed), UpToDate, Waltham, MA, 2007.
Resistant Hypertension

- An obese White female in her 70’s is referred with “resistant hypertension”
- Current medications:
  - Nifedipine XR 90mg daily
  - Atenolol 100mg daily
  - Lisinopril 40mg daily
- Laboratory: Creatinine 150mmol/L
- ECG: Left ventricular hypertrophy
Definition: Resistant Hypertension

- Failure to reach goal BP despite adherence to appropriate treatment with full doses of at least 3 antihypertensive medications, including a diuretic.

- Goal BP
  - ≤140/90 mm Hg in the general population
  - ≤130/80 mm Hg in patients with diabetes or renal disease
Resistant Hypertension

- Improper BP measurement, white coat effect
- Excess sodium intake
- **Inadequate diuretic therapy**
- Medication
  - Inadequate doses
  - Drug actions and interactions (e.g., nonsteroidal anti-inflammatory drugs (NSAIDs), illicit drugs, sympathomimetics, oral contraceptives)
  - Over-the-counter (OTC) drugs and herbal supplements
- Excess alcohol intake
- Identifiable causes of HTN
# Average Number of Anti-Hypertensive Agents Used to Achieve Target BP

<table>
<thead>
<tr>
<th>Goal BP</th>
<th>MDRD</th>
<th>ABCD</th>
<th>HOT</th>
<th>UKPDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;92 mmHg MAP*</td>
<td>&lt;75 mmHg DBP</td>
<td>&lt;80 mmHg DBP</td>
<td>&lt;85 mmHg DBP</td>
<td></td>
</tr>
<tr>
<td>Achieved BP</td>
<td>93</td>
<td>~75</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>Avg # of drugs per patient</td>
<td>3.6</td>
<td>2.7</td>
<td>3.3</td>
<td>2.8</td>
</tr>
</tbody>
</table>

*The goal mean arterial pressure (MAP) of <92 mmHg specified in the MDRD trial corresponds to a systolic/diastolic blood pressure of approximately 125/75 mmHg.
Alerting reaction and rise in blood pressure during measurement by physician and nurse

Effect of spironolactone on blood pressure in subjects with resistant hypertension

\[ \Delta \text{SBP} = 21.9 \]  
(95% CI 20.8, 23.0)

\[ \Delta \text{DBP} = 9.5 \]  
(95% CI 9.0, 10.1)

Obstructive sleep apnea and resistant hypertension


Resistant hypertension (%)

Apnea-hypopnea index

- < 5: 31.0, n = 31
- 5 - 14: 45.8, n = 48
- 15 - 29: 50.0, n = 26
- ≥30: 85.7, n = 21

P = 0.002
Key Messages from JNC-7

- For persons over age 50, **SBP** is a more important than **DBP** as CVD risk factor.
- Starting at 115/75 mmHg, **CVD** risk doubles with each increment of 20/10 mmHg throughout the BP range.
- Those with SBP 120–139 mmHg or DBP 80–89 mmHg should be considered **prehypertensive** who require health-promoting lifestyle modifications to prevent CVD.
- **Thiazide-type diuretics** should be initial drug therapy for most, either alone or combined with other drug classes.
- Certain high-risk conditions are **compelling indications** for other drug classes.
- Most patients will require two or more antihypertensive drugs.
## Compelling Indications for Certain Drug Classes

<table>
<thead>
<tr>
<th>Compelling Indication*</th>
<th>Recommended Drugs‡</th>
<th>Clinical Trial Basis‡</th>
</tr>
</thead>
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Conclusions

- HTN is a risk factor for mortality and cardiovascular and renal disease
- Target BP 140/90 (130/80 in DM, CKD)
- Remember Compelling Indications
The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)

The Guidelines

- JNC 7 Express

Information for Patients

- Your Guide to Lowering Blood Pressure
- Facts About the DASH Eating Plan (revised, May 2003)

Information for Health Professionals

- Physician Reference Card
- Slide Show

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