Hypertension and Its Treatment
A blend of European and United States guidelines

Preston Seaberg, M.D.
Learning Objectives

• Diagnose hypertension and evaluate a person who has it
• Treat a person with hypertension
• Prevent complications of hypertension and its treatment
Why discuss hypertension?

- Rising burden of noncommunicable Disease

Deaths by cause, World

Non-communicable diseases (NCDs) include cardiovascular disease, cancers, diabetes and respiratory disease. Injuries include road accidents, homicides, conflict deaths, drowning, fire-related accidents, natural disasters and suicides.

Source: IHME, Global Burden of Disease
OurWorldInData.org/causes-of-death • CC BY
Why discuss hypertension?

Top 10 global causes of deaths, 2016

- Ischaemic heart disease
- Stroke
- Chronic obstructive pulmonary disease
- Lower respiratory infections
- Alzheimer disease and other dementias
- Trachea, bronchus, lung cancers
- Diabetes mellitus
- Road injury
- Diarrhoeal diseases
- Tuberculosis

Deaths (millions)

Cause Group:
- Communicable, maternal, neonatal and nutritional conditions
- Noncommunicable diseases
- Injuries

Hypertension: Consequences
<table>
<thead>
<tr>
<th>Health Outcomes</th>
<th>Events</th>
<th>Participants</th>
<th>Events</th>
<th>Participants</th>
<th>RR (95% CI) per 10 mm Hg reduction in systolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major cardiovascular events</td>
<td>55</td>
<td>13209</td>
<td>14068</td>
<td>128259</td>
<td>0.80 (0.77–0.83)</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>56</td>
<td>4862</td>
<td>5301</td>
<td>128548</td>
<td>0.83 (0.78–0.88)</td>
</tr>
<tr>
<td>Stroke</td>
<td>54</td>
<td>4635</td>
<td>5378</td>
<td>128641</td>
<td>0.73 (0.68–0.77)</td>
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<tr>
<td>Heart failure</td>
<td>43</td>
<td>3284</td>
<td>3760</td>
<td>107440</td>
<td>0.72 (0.67–0.78)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>16</td>
<td>890</td>
<td>834</td>
<td>39043</td>
<td>0.95 (0.84–1.07)</td>
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<tr>
<td>All-cause mortality</td>
<td>57</td>
<td>9775</td>
<td>9998</td>
<td>129700</td>
<td>0.87 (0.84–0.91)</td>
</tr>
<tr>
<td>Studies</td>
<td>Intervention</td>
<td>Control</td>
<td></td>
<td></td>
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<tr>
<td>---------</td>
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<td></td>
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</tr>
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<td>Events</td>
<td>Participants</td>
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<td>Participants</td>
<td>RR (95% CI) per 10 mm Hg reduction in systolic blood pressure</td>
<td>p&lt;sub&gt;trend&lt;/sub&gt;</td>
</tr>
<tr>
<td>&lt;130</td>
<td>4</td>
<td>530</td>
<td>3881</td>
<td>0.63 (0.50–0.80)</td>
<td></td>
</tr>
<tr>
<td>130-139</td>
<td>17</td>
<td>5856</td>
<td>47167</td>
<td>0.67 (0.82–0.92)</td>
<td></td>
</tr>
<tr>
<td>140-149</td>
<td>7</td>
<td>4694</td>
<td>33062</td>
<td>0.79 (0.72–0.87)</td>
<td></td>
</tr>
<tr>
<td>150-159</td>
<td>13</td>
<td>1257</td>
<td>20088</td>
<td>0.80 (0.71–0.91)</td>
<td></td>
</tr>
<tr>
<td>≥160</td>
<td>14</td>
<td>1731</td>
<td>24060</td>
<td>0.74 (0.69–0.79)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>0.80 (0.77–0.83)</td>
<td></td>
</tr>
</tbody>
</table>

RR per 10 mm Hg reduction in systolic blood pressure.

Favours intervention  Favours control
Coronary heart disease

<table>
<thead>
<tr>
<th>Category</th>
<th>RR (95% CI) per 10 mm Hg reduction in systolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;130</td>
<td>0.55 (0.42–0.72)</td>
</tr>
<tr>
<td>130-139</td>
<td>0.88 (0.80–0.96)</td>
</tr>
<tr>
<td>140-149</td>
<td>0.80 (0.69–0.94)</td>
</tr>
<tr>
<td>150-159</td>
<td>0.84 (0.68–1.05)</td>
</tr>
<tr>
<td>≥160</td>
<td>0.82 (0.73–0.92)</td>
</tr>
<tr>
<td>Total</td>
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<td>Studies</td>
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<td>------------</td>
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</tr>
<tr>
<td></td>
<td>Events</td>
</tr>
<tr>
<td>&lt;130</td>
<td>3</td>
</tr>
<tr>
<td>130-139</td>
<td>18</td>
</tr>
<tr>
<td>140-149</td>
<td>7</td>
</tr>
<tr>
<td>150-159</td>
<td>11</td>
</tr>
<tr>
<td>≥160</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

RR (95% CI) per 10 mm Hg reduction in systolic blood pressure

\( p_{trend} \)

\( 0.38 \)

RR per 10 mm Hg reduction in systolic blood pressure

Favours intervention

Favours control
The table and graph show the risk ratio (RR) and 95% confidence interval (CI) for a 10 mm Hg reduction in systolic blood pressure, categorized by heart failure status and systolic blood pressure level.

- **Heart Failure**: The risk ratio is given for each blood pressure category.
  - **<130 mm Hg**: Risk ratio is 0.83 (0.41-1.70).
  - **130-139 mm Hg**: Risk ratio is 0.75 (0.66-0.85).
  - **140-149 mm Hg**: Risk ratio is 0.83 (0.70-1.00).
  - **150-159 mm Hg**: Risk ratio is 0.96 (0.71-1.30).
  - **≥160 mm Hg**: Risk ratio is 0.61 (0.54-0.70).

- **Total**: The overall risk ratio is 0.72 (0.67-0.78).

The graph indicates that the intervention favours the control group, suggesting a trend towards lower blood pressure in the intervention group compared to the control group.
<table>
<thead>
<tr>
<th>Mean Achieved Systolic Blood Pressure, mm Hg</th>
<th>Hazard Ratio (95% CI)</th>
<th>Favors Lower Blood Pressure</th>
<th>Favors Higher Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction to 120-124</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 125-129</td>
<td>0.82 (0.67-0.97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 130-134</td>
<td>0.71 (0.60-0.83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 135-139</td>
<td>0.68 (0.55-0.85)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 140-144</td>
<td>0.58 (0.48-0.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 145-149</td>
<td>0.55 (0.42-0.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs 150-154</td>
<td>0.46 (0.34-0.63)</td>
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<td></td>
</tr>
<tr>
<td>120-124 vs 155-159</td>
<td>0.41 (0.32-0.54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-124 vs ≥160</td>
<td>0.36 (0.26-0.51)</td>
<td></td>
<td></td>
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<td>130-134 vs ≥160</td>
<td>0.51 (0.39-0.69)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction to 140-144</td>
<td></td>
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</tr>
<tr>
<td>140-144 vs 145-149</td>
<td>0.94 (0.74-1.20)</td>
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<td></td>
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<td>0.79 (0.63-0.99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140-144 vs 155-159</td>
<td>0.70 (0.60-0.84)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140-144 vs ≥160</td>
<td>0.62 (0.48-0.80)</td>
<td></td>
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<td></td>
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</tbody>
</table>

*Bundy JD et al (2017)*
Diagnose and evaluate hypertension

Define hypertension
Evaluate newly diagnosed hypertension
On differences between US and European hypertension guidelines

They really have more similarities than differences

Treat differently those with increased risk of morbidity/mortality

Treat intensively, but balance with treatment tolerability
Hypertension (HTN): Definition

- Ideal: BP <120/<80
- Risks rise after BP ≥130/ ≥80
- ≥2 readings, separated in time
<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic (mmHg)</th>
<th>Diastolic (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Normal</td>
<td>120–129</td>
<td>80–84</td>
</tr>
<tr>
<td>High normal</td>
<td>130–139</td>
<td>85–89</td>
</tr>
<tr>
<td>Grade 1 hypertension</td>
<td>140–159</td>
<td>90–99</td>
</tr>
<tr>
<td>Grade 2 hypertension</td>
<td>160–179</td>
<td>100–109</td>
</tr>
<tr>
<td>Grade 3 hypertension</td>
<td>≥180</td>
<td>≥110</td>
</tr>
<tr>
<td>Isolated systolic hypertension</td>
<td>≥140</td>
<td>&lt;90</td>
</tr>
</tbody>
</table>

\(^a\) Classification of office blood pressure
\(^b\) Definitions of hypertension grade
HTN: More Definitions, Fine Tuning

- 24-hour ambulatory blood pressure (ABPM)
  - Risk rises after BP ≥125/≥75

- “White coat” hypertension
  - BP elevated in office, normal at home
  - Natural history closer to normotension

- “Masked” hypertension
  - BP normal in office, elevated at home
  - Natural history closer to hypertension
HTN: More Definitions

- Pregnancy: same definitions
  - Pre-existing: onset prior to 20 wk gestation
  - Gestational: onset $\geq 20$ wk gestation
  - Pre-existing + gestational
  - Pre-eclampsia: gestational hypertension with proteinuria $> 300$ mg/24 h
  - Antenatally unclassifiable hypertension
Hypertension: Screening and Diagnosis

• Screen all adults
  • Young+low risk: every 3-5 years
  • ≥40 years or high risk: yearly
  • Pregnancy: each visit

• ≥ 2 readings, ≥ 2 occasions
  • Or HTN + target organ damage (Europe)
  • Out-of-office/self-test to confirm

• White coat/masked HTN: 24-hour ABPM

• 90-95% of cases are primary HTN
HTN: Evaluation

- Identify cardiovascular risk factors
- Briefly screen for secondary causes
- Assess for target-organ damage
HTN: Formal Risk Assessment

- Systemic Coronary Risk Evaluation (SCORE), in European Guidelines
- Pooled Cohort Equation, in United States Guidelines
- Overlap: automatically high risk if known ASCVD
- Differences: risk estimates in younger persons
- Recommendation: pick one, use it consistently
# Systematic Coronary Risk Evaluation (SCORE)


## 10 year risk of fatal CVD in high risk regions of Europe by gender, age, systolic blood pressure, total cholesterol and smoking status

### Women

<table>
<thead>
<tr>
<th>Systolic blood pressure (mmHg)</th>
<th>Non-smoker</th>
<th>Smoker</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>7 8 9 10 12</td>
<td>13 15 17 19 22</td>
<td>65</td>
</tr>
<tr>
<td>160</td>
<td>5 5 6 7 8</td>
<td>9 10 12 13 16</td>
<td>65</td>
</tr>
<tr>
<td>140</td>
<td>3 3 4 5 6</td>
<td>6 7 8 9 11</td>
<td>60</td>
</tr>
<tr>
<td>120</td>
<td>2 2 3 4 4</td>
<td>4 5 5 6 7</td>
<td>55</td>
</tr>
</tbody>
</table>

### Men

<table>
<thead>
<tr>
<th>Systolic blood pressure (mmHg)</th>
<th>Non-smoker</th>
<th>Smoker</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>4 4 5 6 7</td>
<td>8 9 10 11 13</td>
<td>65</td>
</tr>
<tr>
<td>160</td>
<td>3 3 3 4 5</td>
<td>5 6 7 8 9</td>
<td>65</td>
</tr>
<tr>
<td>140</td>
<td>2 2 2 3 3</td>
<td>3 4 5 6 6</td>
<td>60</td>
</tr>
<tr>
<td>120</td>
<td>1 1 2 2 2</td>
<td>2 3 3 4 4</td>
<td>55</td>
</tr>
</tbody>
</table>

### Systolic blood pressure (mmHg)

- 140
- 120
- 100
- 80

### Cholesterol (mmol/L)

- 8
- 7
- 6
- 5
- 4

### Conclusion

The SCORE system is a tool used to assess the 10-year risk of fatal cardiovascular disease (CVD) in high-risk regions of Europe. It considers factors such as age, gender, systolic blood pressure, total cholesterol, and smoking status. The charts provide a visual representation of this risk assessment, allowing healthcare professionals to tailor preventive strategies accordingly.
Pooled Cohort Equation for 10-Year Risk of Atherosclerotic Cardiovascular Disease


### Current 10-Year ASCVD Risk:
- Intermediate: 12.3%
- Lifetime ASCVD Risk: 69%
- Optimal ASCVD Risk: 2.3%

#### Risk Factors:
- **Age**: 40
- **Sex**: Male
- **Race**: African American
- **Systolic Blood Pressure**: 180
- **Diastolic Blood Pressure**: 100
- **Total Cholesterol**: 320
- **HDL Cholesterol**: 34
- **LDL Cholesterol**: 180
- **History of Diabetes**: No
- **Smoker**: Yes, Current
- **On Hypertension Treatment**: No
- **On a Statin**: No
- **On Aspirin Therapy**: Yes
HTN: Informal Risk Adjustments

- Coronary artery disease
- Peripheral arterial disease
- Cerebrovascular disease
- Chronic kidney disease
- Diabetes mellitus
- Obstructive sleep apnea
- Preeclampsia
- Sedentary lifestyle
- Family history
HTN Evaluation: Physical Exam

- Check BP in both arms
- Funduscopic exam
- BMI and waist circumference
- Heart
- Vessels
HTN Evaluation: Testing

- Urea, creatinine and electrolytes
- Urinalysis
  - With urine albumin, urine creatinine for some
- Fasting glucose
- Glycohemoglobin
- Fasting cholesterol profile
- Hematocrit (full blood count)
- Electrocardiogram
- Thyroid stimulating hormone
- Medication review

Routine annual follow-up tests in yellow
Hypertension: Why Those Tests?

- ECG: LVH? Previous MI?
- CBC: polycythemia?
- BMP (U&E): CKD? HypoK⁺? HyperCa^{2+}?)
- TSH (hypothyroid: diastolic HTN, classically)
- Cholesterol profile (risk adjustment)
- UA (hematuria, “active” urine sediment,
- Urine albumin:creatinine (risk for progressive kidney disease, inform use of certain medications)
Treat hypertension

Choose whom and when to treat
Counsel on effective lifestyle modification
Select medication(s) based on comorbidities
Set treatment target
Troubleshoot suboptimal treatment response
HTN Treatment: Who, When and How?

- High normal BP: BP 130-139/85-89 mmHg
  - Lifestyle advice
  - Consider drug treatment in very high risk patients with CVD, especially CAD

- Grade 1 Hypertension: BP 140-159/90-99 mmHg
  - Lifestyle advice
  - Immediate drug treatment in high or very high risk patients with CVD, renal disease or HMOD

- Grade 2 Hypertension: BP 160-179/100-109 mmHg
  - Lifestyle advice
  - Immediate drug treatment in all patients
  - Drug treatment in low moderate risk patients without CVD, renal disease or HMOD after 3-6 months of lifestyle intervention if BP not controlled
  - Aim for BP control within 3 months

- Grade 3 Hypertension: BP ≥180/110 mmHg
  - Lifestyle advice
  - Immediate drug treatment in all patients
  - Aim for BP control within 3 months

Williams B et al (2018)

• BP 120-129/<80: lifestyle advice
HTN: Treatment Targets

• First objective: <140/90 mm Hg
• Once there: try even harder, if tolerated!
• Optimal goal: SBP < 130 mm Hg and DBP < 80 mm Hg
  • If BP medications start to cause activity-limiting orthostatic symptoms, reaching optimal goal may not be possible
HTN Treatment: How About Pregnancy?

- All women w/ BP ≥150/95mmHg;
- Gestational hypertension BP > 140/90
- Pre-existing HTN + gestational HTN > 140/90
- Note: essentially based on opinion

Williams B et al (2018)

- Probably safe: labetalol, methyldopa, hydralazine, nifedipine
- Avoid: ACE inhibitors (e.g. lisinopril), ARBs (e.g. losartan), mineralocorticoid receptor antagonists (e.g. spironolactone)
HTN Treatment: First Consider Problem Meds

- Nonsteroidal anti-inflammatory medications
- Combined oral contraceptive pills
  - If HTN troublesome and after weighing risks/benefits to discontinuing COC
- Menopausal hormone therapy
HTN: Then, Lifestyle Modifications

• Alcohol moderation
• Smoking cessation
• Salt restriction
• DASH diet
• Get to ideal body weight
• Regular physical activity
**HTN: Lifestyle Modifications**

- **Stop smoking!**

<table>
<thead>
<tr>
<th>Weight loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expect ~1 mmHg for every 1-kg reduction in body weight</td>
</tr>
<tr>
<td>• Impact on SBP in HTN: -5 mmHg</td>
</tr>
<tr>
<td>• Impact on SBP in normotension: -2/3 mmHg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Healthy diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fruits, vegetables, whole grains, and low-fat dairy products; reduced total and saturated fat and salt (e.g., DASH diet)</td>
</tr>
<tr>
<td>• Impact on SBP in HTN: -11 mmHg</td>
</tr>
<tr>
<td>• Impact on SBP in normotension: -3 mmHg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>↓ Na intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Optimal goal is &lt;1,500 mg/d (~3 grams of salt) but aim for at least 1000 mg/d reduction in most adults</td>
</tr>
<tr>
<td>• Impact on SBP in HTN: -5/6 mmHg</td>
</tr>
<tr>
<td>• Impact on SBP in normotension: -2/3 mmHg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>↑ K intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aim for 3,500-5,000 mg/d (40-60 meq), preferably by consuming a potassium-rich diet</td>
</tr>
<tr>
<td>• Impact on SBP in HTN: -4/5 mmHg</td>
</tr>
<tr>
<td>• Impact on SBP in normotension: -2 mmHg</td>
</tr>
</tbody>
</table>

*2017 ACC-AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults; Hypertension; JACC Nov 2017*
HTN: DASH Diet

The DASH Diet for Healthy Blood Pressure

Follow these DASH (Dietary Approaches to Stop Hypertension) guidelines for a healthier, more balanced diet.

- Grains: 6 to 8 servings per day
- Fresh Fruits and Vegetables: 4 to 5 servings of each per day
- Lean Protein: 6 or less servings per day
- Legumes or Nuts/Seeds: 4 to 5 servings per week
- Low-fat Dairy: 2 to 3 servings per day
- Fats and Sweets: Limited

Learn more at blog.ohiohealth.com.
### HTN: Lifestyle Modifications

- **Stop smoking!**

#### Aerobic exercise
- 90-150 min/week, 65-75% HR reserve
- Impact on SBP in HTN: -5/8 mmHg
- Impact on SBP in normotension: -2/4 mmHg

#### Dynamic resistance
- 90-150 min/week; 50-80% 1 rep max
- Impact on SBP in HTN: -4 mmHg
- Impact on SBP in normotension: -2 mmHg

#### Isometric resistance
- 4x2 min (hand grip), 1 min rest between exercises; 30-40% max voluntary contraction; 3 sessions/week, 8-10/week
- Impact on SBP in HTN: -5 mmHg
- Impact on SBP in normotension: -4 mmHg

#### Moderate alcohol intake
- Men: Reduce to ≤ 2 drinks * daily
- Women: Reduce to ≤ 1 drink * daily
- Impact on SBP in HTN: -4 mmHg
- Impact on SBP in normotension: -3 mmHg

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*In the United States, 1 “standard” drink is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).*

HTN: Combination Therapy Early

- Early combination therapy makes sense
  - May mitigate side effects
  - Preempts provider or patient inertia
  - Faster HTN control
  - SPCs can be used for convenience
  - ESC/ESH recommend early
  - Just don’t combine the wrong things (e.g. ACE+ARB)
  - Caution in frail persons
Antihypertensive dose response to thiazide therapy

Treatment effects reach plateau early...

Dose dependence of thiazide-induced side effects

...but side effects increase with each incremental dose increase

HTN: Effective Pharmacotherapy Options

- Dihydropiridine calcium channel blocker (CCB)
  - e.g. amlodipine, nifedipine

- Diuretic
  - e.g. chlorthalidone, indapamide, hydrochlorothiazide

- Angiotensin converting enzyme (ACE) inhibitor
  - e.g. lisinopril, perindopril, enalapril

- Angiotensin receptor blocker (ARB)
  - e.g. losartan, valsartan
HTN: a Word on β-blockers

- Not particularly effective for hypertension
- Use as **part of combination** when indicated:
  - Ischemic heart disease
  - Heart failure with reduced ejection fraction
  - Carvedilol, metoprolol *succinate*, bisoprolol
  - Atrial fibrillation
HTN: Wise Prescribing

• Chronic kidney disease, albuminuria (even moderately increased at > 30 mg/day)
  • Consider ACE-inhibitor or ARB

• Patient is black
  • Diuretic or CCB better than ACE-inhibitor or ARB

• Patient has angina despite β-blocker: CCB

• Stroke reduction: ACE+CCB > ACE+diuretic

• α-blockers linked to higher risk of heart failure

• Do not combine ACE and ARB!
HTN: Lack of Treatment Response

- Physician inertia
- Insufficient combo therapy
- Treatment complexity
- Patient adherence
- Secondary causes

- 90-95% of patients can achieve target
HTN: Resistant Hypertension

- BP > goal on ≥3 drugs (including diuretic)
- 1. Exclude nonadherence, iatrogenesis
- 2. Consider secondary causes (5-10% of HTN)
- 3. Add spironolactone 25-50 mg OD
  or
- Add bisoprolol or nitrate/hydralazine
- 4. Refer to internist or specialist
  - Advanced Rx strategies: change diuretics
Hypertension: Secondary HTN

• Suspect if
  • Age < 30 years at onset
  • Diastolic HTN after age 65
  • Abrupt onset, or abrupt worsening of previously controlled HTN
  • Drug resistance
  • Suggestive clinical features
  • Disproportionate target organ damage
  • Hypokalemia
Hypertension: Renovascular HTN

• For most, medical therapy equals benefit of invasive procedures
  • Hence, for most, no eval needed

• For young persons with suspected FMD, may consider renal artery imaging
Hypertension: Aldosteronism

- First step: plasma aldosterone:plasma renin activity ratio
  - Very high ratio = suggestive
- Second step: saline suppression test
- Third step: imaging + adrenal venous sampling
  - Unilateral: adrenalectomy?
  - Bilateral (hyperplasia): medical therapy
Prevent complications

Prevent and treat complications and comorbidities
Mitigate adverse effects of medications
HTN: Prevention of Complications

- Yearly Screening
  - Urea, creatinine and electrolytes
  - Urinalysis (urine protein:creatinine for some)
  - Glycohemoglobin
  - Fasting cholesterol profile
  - Hematocrit (full blood count)

- Statin
  - Diabetes
  - ASCVD or high risk of it

- Aspirin
  - Coronary or cerebrovascular disease
<table>
<thead>
<tr>
<th>Drug</th>
<th>Compelling</th>
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ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; HFrEF = heart failure with reduced ejection fraction; LV = left ventricular.
Summary
Summary: HTN Evaluation

- Urea, creatinine and electrolytes
- Urinalysis (urine albumin:creatinine for some)
- Fasting glucose
- Glycohemoglobin
- Fasting cholesterol profile
- Hematocrit (full blood count)
- Electrocardiogram
- Thyroid stimulating hormone
- Medication review

Routine annual follow-up tests in yellow
Summary: HTN Treatment, Goal < 130/80

1 Pill
- Initial therapy
  - Dual combination

Two of these: diuretic, CCB, ACE-inhibitor/ARB

2-4 weeks → Max or add

1 Pill
- Step 2
  - Triple combination

All of these*: diuretic, CCB, ACE-inhibitor/ARB

Step 3
- Triple combination + spironolactone or other drug

Resistant hypertension
- Add spironolactone (25-50 mg o.d.) or other diuretic, alpha-blocker or beta-blocker

- Consider monotherapy in low risk grade 1 hypertension (systolic BP <150mmHg), or in very old (≥80 years) or frailter patients
- Consider initiating therapy when systolic BP is ≥130 mmHg in very high risk patients with established CVD
- Consider referral to a specialist centre for further investigation

Lifestyle modifications for all with BP >120/80: smoking cessation, weight loss if overweight, healthy diet such as DASH diet, sodium restriction, aerobic exercise, reduce alcohol consumption if more than moderate

Beta-blockers
- Consider beta-blockers at any treatment step, when there is a specific indication for their use, e.g. heart failure, angina, post-MI, atrial fibrillation, or younger women with, or planning, pregnancy

A reduction in eGFR and rise in serum creatinine is expected in patients with CKD who receive BP-lowering therapy, especially in those treated with an ACEi orARB but a rise in serum creatinine of >30% should prompt evaluation of the patient for possible renovascular disease.
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References


• Mann JFE. “Choice of drug therapy in primary (essential) hypertension.” In: UpToDate, Bakris GL and White WB, Waltham, MA, 2020.