Hypertension 2016
Case Based Approach

Ally P.H. Prebtani
Professor of Medicine
Internal Medicine, Endocrinology & Metabolism

McMaster University, Canada
Learning objectives

1. What is new in HTN
2. How to Dx HTN
3. Update in guidelines
4. Refractory HTN
5. When to refer?
Cases

1. 59yo man DM-2, + ACR, no CAD, BP 145/94, rest BW normal
2. 22yo woman healthy BP 150/92, no CRF or EOD
3. 50yo woman with BP 165/98, no CRF, thin, creat normal K 3.4
4. 70yo man CHF (Ef 22%), no DM, Cr 65 BP 140/90, on Furosemide, NTP...
5. 74yo ischemic stroke BP 170/94; no DM or CAD, creat/K normal
Benefits of lowering mild to moderate blood pressure (BP)

<table>
<thead>
<tr>
<th></th>
<th>Percent reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>35–40%</td>
</tr>
<tr>
<td>Myocardial infarction (MI)</td>
<td>20–25%</td>
</tr>
<tr>
<td>Heart failure (HF)</td>
<td>50%</td>
</tr>
</tbody>
</table>

Causes

- **Essential HTN**
  - > 95%
- **Others/Secondary causes**
  - Cardiac
  - **Endocrine**
    - Primary Hyperaldosteronism
  - Renal
  - Drugs/Toxins
    - Salt, EtOH, NSAIDs, Herbals/Licorice, OTCs, OCPs
  - OSA
  - Pregnancy
Usual Office BP **Threshold Values for Initiation of Pharmacological Treatment**

<table>
<thead>
<tr>
<th>Population</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk (SPRINT population)</td>
<td>&gt;130</td>
<td>NA</td>
</tr>
<tr>
<td>Diabetes</td>
<td>&gt;130</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Moderate-to-high risk (TOD or CV risk factors)*</td>
<td>&gt;140</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Low risk (no TOD or CV risk factors)</td>
<td>&gt;160</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>

**TOD = target organ damage**

*AOBP threshold ≥135/85*
Recommended Office BP Treatment Targets

Treatment consists of health behaviour ± pharmacological management

<table>
<thead>
<tr>
<th>Population</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk</td>
<td>≤120</td>
<td>NA</td>
</tr>
<tr>
<td>Diabetes</td>
<td>&lt; 130</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>All others*</td>
<td>&lt; 140</td>
<td>&lt; 90</td>
</tr>
</tbody>
</table>

* Target BP with AOBP < 135/85
### Benefit vs harm of intensive and standard systolic pressure control in SPRINT

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Absolute risk reduction</th>
<th>Number needed to treat</th>
<th>Absolute risk increase</th>
<th>Number needed to harm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome</td>
<td>−1.6%</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart failure</td>
<td>−0.8%</td>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular mortality</td>
<td>−0.6%</td>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>−1.2%</td>
<td>83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>+1.0%</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syncope</td>
<td>+0.6%</td>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrolyte abnormalities</td>
<td>+0.8%</td>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute kidney injury</td>
<td>+1.6%</td>
<td>62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New thresholds/targets for the high risk patient post-SPRINT: who does this apply to??

- Clinical or sub-clinical cardiovascular disease
  OR
- CKD (non-diabetic nephropathy, proteinuria <1 g/d, *eGFR 20-59 mL/min/1.73m²)
  OR
- †Estimated 10-year global cardiovascular risk ≥15%
  OR
- Age ≥ 75 years

Patients with one or more clinical indications should consent to intensive management.

* Four variable MDRD equation
† Framingham Risk Score, D'Agostino, Circulation 2008
2015 Recommendation on BP Measurement

AOBP:

• Electronic (oscillometric) devices in upper arm
• HCP outside the room/area (mitigates white coat effect)
• Multiple readings
• Mean automatically calculated
Predictive value of AOBP

AOBP predicts end-organ damage

• Systolic AOBP correlates with LVMI similarly to awake ABPM
• AOBP & 24-h ABPM have similar predictive ability for uACR
• AOBP is more strongly associated with cIMT (compared to OBPM)

\[ \text{cIMT: Carotid Intima Media Thickness} \]
\[ \text{LVMI: Left Ventricular Mass Index} \]

Out-of-Office BP Measurements

- ABPM > predictive ability than OBPM and is the recommended out-of-office measurement method.
- HBPM has > predictive ability than OBPM & recommended if ABPM is not tolerated, readily available or due to patient preference.
- Identifies white coat hypertension and masked HTN.
Out-of-office BP measurements are more highly correlated with BP-related risk.

White Coat and Masked Hypertension

Evaluation

1. End Organ Damage
2. Overall CV Risk
3. r/o Secondary causes

• History & PE
• Labs
  • U/A, glucose, A1c, creatinine/GFR, lytes (K+)
  • Fasting Lipids
• ECG
• Other tests as indicated, uMicroalbumin, Echo...
1. **Out of office** assessment is the preferred means of hypertension Dx
2. **Measurement using electronic** (oscillometric) upper arm devices is preferred over auscultation

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**Hypertension Diagnostic Algorithm**

1. Elevated BP Reading (office, home or pharmacy)
2. Dedicated Office Visit
   - Mean Office BP ≥ 180/110
3. No Diabetes
   - 1. AOBP ≥ 135/85 (preferred)
     - OR
     - 2. Non-AOBP ≥ 140/90 (if AOBP unavailable)
   - No Hypertension
4. Diabetes
   - 1. AOBP or non-AOBP ≥ 130/80
   - Out-of-office Measurement
     - 1. ABPM (preferred)
       - Daytime mean ≥ 135/85
       - 24-hour mean ≥ 130/80
       - OR
     - 2. Home BP Series
       - Mean ≥ 135/85
   - White Coat Hypertension

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**ABPM**: Ambulatory Blood Pressure Measurement

**AOBP**: Automated Office Blood Pressure
## Impact of health behaviours on blood pressure

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Systolic BP (mmHg)</th>
<th>Diastolic BP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet and weight control (BMI &lt; 25; WC &lt; 90-100**)</td>
<td>-6.0</td>
<td>-4.8</td>
</tr>
<tr>
<td>Reduced salt/sodium intake &lt; 2g/d</td>
<td>-5.4</td>
<td>-2.8</td>
</tr>
<tr>
<td>Reduced alcohol intake (heavy drinkers) &lt; 2 drinks/day</td>
<td>-3.4</td>
<td>-3.4</td>
</tr>
<tr>
<td>DASH diet</td>
<td>-11.4</td>
<td>-5.5</td>
</tr>
<tr>
<td>Physical activity (30-60 minutes 4-7 days/week)</td>
<td>-3.1</td>
<td>-1.8</td>
</tr>
<tr>
<td>Relaxation therapies</td>
<td>-3.7</td>
<td>-3.5</td>
</tr>
<tr>
<td>Multiple interventions</td>
<td>-5.5</td>
<td>-4.5</td>
</tr>
</tbody>
</table>
Impact of discussing coronary risk with patients on blood pressure treatment

Informing Patients of Their Global Risk improves BP Control
Cardiovascular Age™ www.myhealthcheckup.com

"How's the low-sodium diet coming along?"
It’s Lunch Time!

**Sodium in Lunch**

<table>
<thead>
<tr>
<th>Item</th>
<th>Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deli Turkey (4 oz)</td>
<td>900 mg</td>
</tr>
<tr>
<td>Wheat Bread (2 slices)</td>
<td>320 mg</td>
</tr>
<tr>
<td>Soup (1 bowl)</td>
<td>700 mg</td>
</tr>
<tr>
<td>Balsamic Vinaigrette Dressing (2 Tbsp)</td>
<td>200 mg</td>
</tr>
<tr>
<td>Salad (2 cups)</td>
<td>65 mg</td>
</tr>
<tr>
<td><strong>Total sodium</strong></td>
<td><strong>2185 mg</strong></td>
</tr>
</tbody>
</table>

**Top 10 Sources of Sodium**

1. Bread & rolls
2. Cold cuts & cured meats
3. Pizza
4. Poultry
5. Soups
6. Sandwiches
7. Cheese
8. Pasta dishes
9. Meat dishes
10. Snacks
Effect of resistance training on BP: 
*meta-analysis in normotensives and hypertensives*

- Overall reduced BP BUT no significant BP changes in hypertensives
- NO evidence for deterioration in BP control in hypertensives NOR adverse effects

Drugs

- Thiazides
  - Long term safety, efficacy
  - chlorthalidone, indapamide, HCTZ
- ACEIs
  - Cough, angioedema, K/Creat
- ARBs
  - As above but no cough
- DHP-CCBs
  - Edema, HA
- Beta Blockers
  - Asthma, bradycardia
- Alpha Blockers
  - Syncope
- Spironolactone
  - K/Creat, gynecomastia
- Combination Therapy
Treatment of Adults with Systolic/Diastolic Hypertension without Other Compelling Indications

**TARGET** <140/90 mmHg

**INITIAL TREATMENT AND MONOTHERAPY**

- *BBs are not indicated as first line therapy for age 60 and above

- Beta-blocker
- Long-acting CCB
- Thiazide
- ACEI
- ARB

**Lifestyle modification therapy**

- IF BLOOD PRESSURE IS NOT CONTROLLED
- Consider
  - Nonadherence
  - Secondary HTN
  - Interfering drugs or lifestyle
  - White coat effect

A combination of 2 first line drugs may be considered as initial therapy if the blood pressure is >20 mmHg systolic or >10 mmHg diastolic above target

*BBs are not indicated as first line therapy for age 60 and above

ACEI, ARB and direct renin inhibitors are contraindicated in pregnancy and caution is required in prescribing to women of child bearing potential
Ratio of Incremental SBP lowering effect at “standard dose”– Combine or Double?

Wald et al. Combination Versus Monotherapy for Blood Pressure Reduction, The American Journal of Medicine, Vol 122, No 3, March 2009
Adherence according to # of daily doses (%)

- 1/day: 79%
- 2/day: 69%
- 3/day: 65%
- 4/day: 51%

Average: 71% of medication

n=85 reports

Adherence improved by a multi-pronged approach

• Assess adherence at every visit
• Take pills on regular schedule with routine daily activity e.g. brushing teeth
• Simplify regimens using long-acting once-daily dosing
• Utilize fixed-dose combination pills
• Utilize unit-of-use packaging e.g. blister packaging
• Replacing with single pill combinations
Strong Evidence for Vascular Protection

• Smoking Cessation
• Statins
• Low dose ASA

Cochrane network meta-analysis 2014
Kate Cahill et al
Methods of Risk Assessment

- Clinical impression
- Risk factor counting
- Risk calculation or equation tools

- SCORE Canada – Systematic Cerebrovascular and Coronary Risk Evaluation www.scorecanada.ca
- Cardiovascular Age™ www.myhealthcheckup.com
- Others: see notes
Resistant/Refractory HTN

- Suboptimal therapy
  - Not on diuretic
- Extracellular volume expansion
  - Salt
- Poor compliance
  - Combo pill, HBPM
- Secondary hypertension
  - Primary hyperaldosteronism, NSAIDs, EtOH
- Office or "white coat" hypertension
- Pseudo-hypertension
  - technique
When to think of Secondary HTN

- Extremes of age
- Abrupt worsening
- Refractory to > 3 drugs
- FH of secondary cause
- End organ damage out of proportion to BP
- Clinical clues eg. Pheo, Cushing’s, OSA, renal bruit
- Biochemical clues eg. Hypokalemia, creatinine
- Imaging clues eg. adrenal lesion
When to refer to HTN specialist?

- Truly refractory
- Secondary cause of HTN
- Intolerance to many medications
- End organ damage requiring more specialized care
New Messages

- Make correct Dx early & properly/technique
  - AOBP
  - Use of HBPM/ABPM
  - If HTN end-organ damage is present with ok office/home BPs, look for masked HTN

- Lifestyle measures
- Assess overall CV profile “GLOBAL RISK”
  - Lipid Tx, ? ASA
- Patient “buy in” for adherence, Combo pills, once daily forms
- Avoid ACEI & ARB combo for the most part
- Aldosterone antagonists
  - esp LV dysfunction
- If the patient is not at target, ask why?
  - Ask about salt intake, EtOH, adherence, OSA
  - Proper BP technique
  - Home BP monitoring/ABP
Websites

www.hypertension.ca
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