Hypertension Management
Controversies in the Elderly Patient

Juan Bowen, MD
Geriatric Update for the Primary Care Provider
November 17, 2016
Disclosure

• No financial relationships

• No discussion of off-label and/or investigative uses
Learning Objectives

• 1. Identify elderly patients who may benefit from hypertension treatment.
• 2. Apply current evidence in managing hypertension in the elderly.
Case

- 80 year-old man who is asymptomatic and with no significant chronic health conditions. At a preventive health visit BP is 150/70. Renal function, electrolytes, ECG, and chest X-ray are normal.
Which Option is Best?

- A. He is hypertensive. Start HCTZ.
- B. Additional information regarding BP is needed. Order six-hour ambulatory blood pressure monitor.
- C. He is normotensive for his age. No treatment.
- D. He should have a workup for secondary HTN.
Hypertension

• **BP = CO × TPR**

• **Primary HTN**
  • 90%
  • Often familial
  • Complex interaction of genetic and environmental factors
Monogenic and Complex Disorders

- Gene
- Environment

T2DM
CAD
HTN
Cancer
Obesity
Stroke
Genetic/Environmental Factors in HTN

- ↑ sympathetic activity
- ↑ sodium-retaining hormones
- ↑ renin secretion
- endothelial dysfunction
- ↑ vascular reactivity
- deficiencies of vasodilators
- overactive growth factor pathways
Genetic/Environmental Factors in HTN

- chronically elevated sodium intake
- inadequate dietary calcium and potassium
- obstructive sleep apnea
- diabetes
- obesity
- alcohol
Pathophysiology in the Elderly

- Increased vascular stiffness
- ↑ systolic and ↓ diastolic BP
Definition of Hypertension

- **JNC7**: Normal BP < 120/80 mmHg
- **JNC8**: BP<150/90 > age 60
Prevalence of Hypertension by Age/Sex

Population (%)

Age (years)

Male
Female

20-34  35-44  45-54  55-64  65-74  ≥75

9.1  6.7  24.4  17.6  37.7  34  52  52  63.9  70.8  72.1  80.1

Circulation, 2013
Target Organ Damage in HTN

- Heart
- Brain
- Kidney
- Eye
<table>
<thead>
<tr>
<th>$V_1$</th>
<th>$V_6$</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Normal ECG" /></td>
<td><img src="image2" alt="Normal ECG" /></td>
</tr>
<tr>
<td><img src="image3" alt="LVH ECG" /></td>
<td><img src="image4" alt="LVH ECG" /></td>
</tr>
</tbody>
</table>

Diagram showing the progression from normal to hypertrophy and then to dilatation, with stages including:

- Normal LV
- Concentric LV remodelling
- Concentric LVH
- Eccentric LVH
- LV failure Systolic LVD
Stroke Prevalence by Age/Sex

- **Men**
- **Women**

![Bar chart showing stroke prevalence by age and sex.](chart.png)

- **Prevalence (%)**
- **Age**
  - 30-49
  - 50-59
  - 60-69
  - 70-89

*Stroke, 2008*
Stroke Risk by Age and BP

Mortality-adjusted cumulative risk (%)

- Normal BP
- Pre HTN
- HTN Stage 1
- HTN Stage 2

Age in years

65 70 75 80 85 90 95
JNC 7 Stages of Hypertension
### Optimal blood pressure

<table>
<thead>
<tr>
<th>Range</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt;120/80</td>
</tr>
</tbody>
</table>

### Pre-hypertension (high-normal)

<table>
<thead>
<tr>
<th>Range</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-hypertension</td>
<td>120-139/80-89</td>
</tr>
</tbody>
</table>

### Stage 1 (moderate risk)

<table>
<thead>
<tr>
<th>Range</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>140-159/90-99</td>
</tr>
</tbody>
</table>

### Stage 2 (high risk)

<table>
<thead>
<tr>
<th>Range</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2</td>
<td>≥ 160/100</td>
</tr>
</tbody>
</table>

*JAMA. 2003;289(19):2560-2571*
Measuring BP

- Office
- Home and ABPM
  - Assess response to therapy
  - Improve adherence with therapy
  - Evaluate white coat hypertension
White Coat Hypertension

Office BP > 140/90

20-30% patients

Home or ABPM

Normal BP
Excellent Prognosis

Hypertension. 2013; 62: 988-994
Is Treatment Effective?

• Evidence from clinical trials - end points
• Benefits
  • Number needed to treat (NNT)
• Harms
  • Number needed to harm (NNH)
  • Adverse effects, cost, work of treatment
• Years of potential benefit
  • Life expectancy
  • $\geq 80$ years (oldest old) are different
Elderly in Large Clinical Trials

- **ALLHAT** 5600 avg age 71, eGFR <60
- **HYVET** 3845 80+ yrs SBP > 160
- **SHEP** 4700 > 60 yrs
- **SPRINT** 9361 30% > 75 yrs
Systolic HTN in Elderly Program (SHEP)

• 4736 ≥ 60 yrs

• BP reduction from 170/77 to 143/78 mm Hg reduced heart failure events from 4.4% to 2.3%.
  • RRR 51%
  • ARR 2.1%
Heart Outcomes Prevention Evaluation (HOPE)

• 9297 with DM or vascular disease
• Ramipril → BP 139/79 to 136/76 mm Hg
• Heart failure events reduced from 11.5% to 9.0%
  • RRR 22%
  • ARR 2.5%
HTN in the Very Elderly Trial (HYVET)

- 3845 ≥ 80 yrs
- BP reduction from 173/91 to 144/78 mm Hg was associated with a reduction in heart failure events from 14.8% to 5.3%
  - RRR 64%
  - ARR 9.5%
JNC 8: Hypertension Management

3 questions

1. Do specific BP thresholds for starting treatment improve outcomes?
2. Does treating to a specific goal BP lead to improved outcomes?
3. Are specific medications or combinations more effective in certain patient groups?
Primary Outcome:
Composite of Myocardial Infarction, ACS, Stroke, CV Death and Acute Decompensated CHF

SPRINT Trial Design

1) Age > 50 years
2) SBP 130-180 mmHg
3) Increased CV Risk
   (1+ of clinical or subclinical CVD other than stroke, CKD with eGFR 20-60 ml/min, Framingham 10yr risk >15% or age > 75 years)

Excluded Patients with Diabetes or Stroke

<table>
<thead>
<tr>
<th>Intensive BP</th>
<th>Standard BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal SBP &lt; 120 mmHg</td>
<td>Goal SBP &lt; 140 mmHg</td>
</tr>
<tr>
<td>Meds titrated to keep SBP 135-139 mmHg</td>
<td></td>
</tr>
</tbody>
</table>

SPRINT Trial Results

Intensive BP
- Mean BP 121 mmHg
- Mean 2.8 Medications
- Primary outcome 1.7% per yr
- Mortality HR 0.73 (0.6-0.9)
- Higher rates of hypotension, syncope, electrolyte abnormalities & acute kidney injury

Standard BP
- Mean BP 136 mmHg
- Mean 1.8 Medications
- Primary outcome 2.2% per yr

JNC 8 Guidelines

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)

Paul A. James, MD; Suzanne Oparil, MD; Barry L. Carter, PharmD; William C. Cushman, MD; Cheryl Dennison-Himmelfarb, RN, ANP, PhD; Joel Handler, MD; Daniel T. Lackland, DrPH; Michael L. LeFevre, MD, MSPH; Thomas D. MacKenzie, MD, MSPH; Olugbenga Ogedegbe, MD, MPH, MS; Sidney C. Smith Jr, MD; Laura P. Svetkey, MD, MHS; Sandra J. Taler, MD; Raymond R. Townsend, MD; Jackson T. Wright Jr, MD, PhD; Andrew S. Narva, MD; Eduardo Ortiz, MD, MPH

JAMA. 2014;311(5):507-520
JNC 8 vs. SPRINT Trial

Goal SBP (mmHg)

**JNC 8**
- < 150/90 (age ≥ 60)
- < 140/90 (age < 60, diabetes or CKD)

**Sprint Trial**
- < 120 (intensive)
  - mean SBP 121
- Increased CV Risk
- Average age 68 years
- Excluded stroke or diabetes

Deciding How to Treat

- Benefits of treatment of hypertension
- Patient adherence factors
- Treatment of Hypertension
  - Lifestyle modifications
  - Medication management based on patient characteristics
Benefits of Hypertension Treatment

- **Stroke Incidence:** 35–40%
- **Myocardial Infarction:** 20–25%
- **Heart Failure:** > 50%

*JAMA. 2014;311(5):507-520*
### Lifestyle Modification

<table>
<thead>
<tr>
<th>Lifestyle Change</th>
<th>↓ SBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>1 mmHg/1 kg weight loss</td>
</tr>
<tr>
<td>DASH eating plan</td>
<td>11 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>Moderate alcohol use</td>
<td>2-4 mmHg</td>
</tr>
<tr>
<td>Avoid NSAIDS</td>
<td>5 mmHg</td>
</tr>
</tbody>
</table>

JNC 8  
Hypertension 2003;42:878-884  
NEJM 2001;344:3  
Lancet 2005;366:1248
2015 Dietary Sodium Recommendations for Americans*

- Sodium intake < 2300 mg per day
- Sodium intake < 1500 mg per day
  - Hypertension or pre-hypertension
  - Can lead to better blood pressure control

IOM Systematic Review 2013: Inconclusive evidence to lower sodium < 1500 mg per day for Diabetes, CKD, Heart disease or Hypertension

Scientific Report of the 2015 Dietary Guidelines Advisory Committee
Sources of Dietary Sodium

- Processed Foods
- Eating Out
- Table Salt

*JAMA Intern Med. 2014;174(1):136-137*
Mean Arterial BP ↓ With Salt Restriction

based on age and average BP

Hypertension. 2016;68:00-00.
DASH Diet

Daily Servings

- 2 oils
- 2 lean meat or fish
- 2-3 low fat dairy
- 4-5 nuts/beans
- 7-8 whole grains
- 4-5 each of vegetables and fruit

Weight Loss and Beneficial Effects on CVD Risk and Risk Factors

- Cochrane systematic review 2016
  - Weight loss intervention (6-36 mo.)

↓ weight 4.0 kg
↓ SBP 4.5 mmHg
↓ DBP 3.2 mmHg

Medication Recommendations for HTN
When to Add Medications?

Low CV Risk and BP < 160/100
- Lifestyle changes x 3-6 months
- If BP > 140/90 then medications

High CV Risk or BP ≥ 160/100
- Lifestyle changes
- Medication

Circulation 2010; 122:406
Goals of Treatment

- Decrease morbidity and mortality
- Blood pressure medical treatment for 5 years

- NNT= 125 for 1 prevented death
- NNT= 67 for 1 prevented stroke
- NNT= 100 for 1 prevented heart attack
- NNH= 10 for 1 harmed

(NNT: Number Needed to Treat)

Potential Harms

• Adverse effects
  • Beers criteria
  • Orthostatic hypotension → falls
  • Electrolyte disorders

• Multiple medications
  • SPRINT
    • 4 BP meds to achieve SBP<120
    • 3 BP meds in control group
Additional Considerations

• Burdens of care
  • Cost
  • Adherence

• Years of potential benefit
  • Life expectancy
    • 80 year-old man → 89
    • 80 year-old woman → 90

• Is there adequate family/social support?
Hypertension Medication Selection

General Population
- Thiazide
- CCB
- ACE Inhibitor
- ARB

Black Population
- Thiazide
- CCB

Chronic Kidney Disease
- ACE Inhibitor
- ARB

Even with Diabetes
Hypertension Medication Selection

- Recent MI or Systolic CHF: Bblocker, ACE Inhibitor, ARB
- Stable CAD: ACE Inhibitor, Bblocker, CCB

If Angina

AME 2015
JAMA 311(5):507, 2014
Drug Titration Strategies

A

Maximize first medication dose

B

Add 2\textsuperscript{nd} med before max 1\textsuperscript{st} med dose

C

Start with 2 medications

Not at goal blood pressure?
Reinforce lifestyle & adherence

Add Thiazide, CCB, ACEi or ARB

Max doses and then add new med class

Titrate doses to max

Not at goal blood pressure despite max dose of thiazide, CCB, ACEi or ARB?
Add new med class (aldosterone antagonist, Bblocker or other) and refer to HTN specialist
Ongoing Monitoring

- 1 new medication at a time
- Start with lowest available dose
- Slow up-titration
- Follow-up
  - BP, adherence, adverse effects
- Care team: MD, NP/PA, nurse, family
My Approach

• Consider benefits and risks
• Is this patient represented in trials?
  • ≥ 80 years (oldest old)
  • frail, multiple morbidities, cognitive impairment → evolving evidence

• Define goals of care with patient and family
• Arrive at a realistic approach using clinical judgment
Case

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Thank You!

bowen.juan@mayo.edu