TOP 10 POINTS TO IMPLEMENT THE 2017 ACC/AHA HYPERTENSION GUIDELINES

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Conflicts of Interest
Robert M. Carey, MD, MACP, FAHA

– Financial
  None

– Institutional
  University of Virginia

– Organizational
  American Heart Association
  American College of Physicians
Top 10 Take-Home Messages and Companion Cases

2017 Hypertension Guidelines
1. In all individuals, use proper methods for accurate measurement and documentation of BP.

Accurate measurement and recording of BP are essential to categorize level of BP, ascertain BP-related CVD risk and guide management of high BP.

Most systematic errors in BP measurement can be avoided by following the suggestions in the next slide.
# Checklist for Accurate Measurement of BP

<table>
<thead>
<tr>
<th>Key Steps for Proper BP Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Properly prepare the patient.</td>
</tr>
<tr>
<td>Step 2: Use proper technique for BP measurements.</td>
</tr>
<tr>
<td>Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension.</td>
</tr>
<tr>
<td>Step 4: Properly document accurate BP readings.</td>
</tr>
<tr>
<td>Step 5: Average the readings (≥2 readings on each of ≥2 occasions).</td>
</tr>
<tr>
<td>Step 6: Provide BP readings to patient.</td>
</tr>
</tbody>
</table>
Use Proper Technique

1. Use an upper-arm cuff BP measurement device that has been validated, and ensure that the device is calibrated periodically.
2. Support the patient’s arm (eg, resting on a desk). The patient should not be holding his/her arm because isometric exercise will affect the BP levels.
3. Position the middle of the cuff on patient’s upper arm at the level of the right atrium (midpoint of the sternum).
4. Use the correct cuff size such that the bladder encircles 75%–100% of the arm.
5. Use either the stethoscope diaphragm or bell for auscultatory readings.
Properly Prepare the Patient

1. Have patient relax, sitting in a chair with feet flat on floor and back supported. Patient should be seated for 3–5 min without talking or moving before recording the first BP reading. A shorter wait period is used for some AOBP devices.
2. Patient should avoid caffeine, exercise, and smoking for at least 30 min before measurement.
3. Ensure that patient has emptied his/her bladder.
4. Neither patient nor observer should talk during the rest period or measurement.
5. Remove clothing covering the location of cuff placement.
6. Measurements made while patient is sitting on an examining table do not fulfill these criteria.
Take Proper Measurements

1. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings.
2. Separate repeated measurements by 1–2 min.
3. For auscultatory determinations, use a palpated estimate of radial pulse obliteration pressure to estimate SBP. Inflate the cuff 20–30 mm Hg above this level for an auscultatory determination of the BP level.
4. For auscultatory readings, deflate the cuff pressure 2 mm Hg/s, and listen for Korotkoff sounds.
2. Classify BP as normal, elevated, or Stage 1 or 2 hypertension to prevent and treat high BP.

The choice and naming of BP categories is based on a pragmatic interpretation of BP-related CVD risk and the benefit of BP reduction in clinical trials.
Estimated Risk of BP-related Coronary Heart Disease by Level of Systolic Blood Pressure

Experience during an average of 11.6 years of follow-up in 347,978 adults screened for entry into the Multiple Risk Factor Intervention Trial

130-139 category almost double risk of CHD (and stroke) vs. normal BP

130-139 category high prevalence

# BP CLASSIFICATION (JNC 7 and ACC/AHA Guidelines)

<table>
<thead>
<tr>
<th>SBP</th>
<th>DBP</th>
<th>2003 JNC7</th>
<th>2017 ACC/AHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120</td>
<td>&lt;80</td>
<td>Normal BP</td>
<td>Normal BP</td>
</tr>
<tr>
<td>120–129</td>
<td>&lt;80</td>
<td>Prehypertension</td>
<td>Elevated BP</td>
</tr>
<tr>
<td>130–139</td>
<td>80–89</td>
<td>Stage 1 hypertension</td>
<td>Stage 1 hypertension</td>
</tr>
<tr>
<td>140–159</td>
<td>90–99</td>
<td>Stage 1 hypertension</td>
<td>Stage 2 hypertension</td>
</tr>
<tr>
<td>≥160</td>
<td>≥100</td>
<td>Stage 2 hypertension</td>
<td>Stage 2 hypertension</td>
</tr>
</tbody>
</table>

- Blood Pressure should be based on an average of ≥2 careful readings on ≥2 occasions
- Adults with SBP or DBP in two categories should be designated to the higher BP category

3. Use out-of-office BP measurements (ABPM and HBPM) to confirm the diagnosis of hypertension and to titrate antihypertensive medication in conjunction with telehealth counseling or clinical interventions.

Using a combination of office and out-of-office BP measurements, several useful BP patterns can be discerned. There are no data on the risks and benefits of treating white coat or masked hypertension. However, the data indicate that masked hypertension and masked uncontrolled hypertension are associated with high risk of CVD and mortality. On the other hand, white coat hypertension and white coat effect are associated with minimum to only slightly increased risk of CVD and mortality compared with normal BP.
## BP Patterns Based on Office and Out-of-Office Measurements

<table>
<thead>
<tr>
<th>Normotensive</th>
<th>No hypertension</th>
<th>No hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustained hypertension</td>
<td>Hypertension</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Masked hypertension</td>
<td>No hypertension</td>
<td>Hypertension</td>
</tr>
<tr>
<td>White coat hypertension</td>
<td>Hypertension</td>
<td>No hypertension</td>
</tr>
</tbody>
</table>
Detection of White Coat Hypertension or Masked Hypertension in Patients not on Drug Therapy

Office BP ≥130/80 mm Hg but < 160/100 mm Hg after 3 mos lifestyle modification; suspect WCH

Daytime ABPM or HBPM BP <130/80 mm Hg

Yes

White Coat Hypertension
- Lifestyle mod
- Annual ABPM or HBPM to detect progression (Class IIa)

No

Hypertension
Continue lifestyle mod and start antihypertensive drug therapy (Class IIa)

Office BP 120-129/<80 mm Hg after 3 mos lifestyle modification; suspect MH

Daytime ABPM or HBPM BP ≥130/80 mm Hg

Yes

Masked Hypertension
Continue lifestyle mod and start antihypertensive therapy (Class IIa)

No

Elevated BP
- Lifestyle modification
- Annual ABPM or HBPM to detect MH (Class IIa)

ABPM: ambulatory BP monitoring; HBPM: home BP monitoring
Top 10 Take Home Messages

4. Screen for specific forms of secondary hypertension if clinical indications are present or in adults with resistant hypertension.
**New onset or uncontrolled hypertension in adults**

**Conditions:**
- Drug-resistant/induced hypertension
- Abrupt onset of hypertension
- Onset of hypertension at <30 y
- Exacerbation of previously controlled hypertension
- Disproportionate TOD for degree of hypertension
- Accelerated/malignant hypertension
- Onset of diastolic hypertension in older adults (≥ 65 y)
- Unprovoked or excessive hypokalemia

**Screening flowchart:**
- **Screen for secondary hypertension**
  - Class I
  - **Positive screening test**
    - **YES** → Refer to clinician with specific expertise
      - Class IIb
    - **NO** → Referral not necessary
      - No benefit
- **Screening not indicated**
  - No benefit
Case 1

- 50 year-old male with no CVD
- No diabetes mellitus or chronic kidney disease
- Average office BP 135/86 mmHg

Recommended treatment?

First, calculate the 10-year ASCVD risk score.
5. In patients with Stage 1 hypertension (BP 130-139/80-89 mmHg), assess for clinical ASCVD or, if absent, estimate 10-y ASCVD risk.

Whereas treatment of high BP with BP-lowering agents on the basis of BP level alone is cost-effective, use of a combination of absolute ASCVD risk and BP level to guide treatment decisions is more efficient and cost-effective at reducing risk of CVD events than is use of BP level alone.
BP TREATMENT THRESHOLD AND THE USE OF ASCVD RISK ESTIMATION TO GUIDE DRUG TREATMENT OF HYPERTENSION

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations for BP Treatment Threshold and Use of ASCVD Risk Estimation* to Guide Drug Treatment of Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SBP: A</td>
<td><strong>1.</strong> Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and average BP ≥130/80 mm Hg, and for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk ≥10% and average BP ≥130/80 mm Hg.</td>
</tr>
<tr>
<td>I</td>
<td>DBP: C-EO</td>
<td><strong>2.</strong> Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-year ASCVD risk &lt;10% and average BP ≥140/90 mm Hg.</td>
</tr>
</tbody>
</table>

* ACC/AHA Pooled Cohort Equations to estimate 10-y risk of ASCVD. ASCVD was defined as a first nonfatal MI or CHD death, or fatal or nonfatal stroke among adults free of CVD.
ACC/AHA POOLED COHORT EQUATIONS

To estimate the 10-year risk of ASCVD

Based on age, race, sex, total cholesterol, LDL cholesterol, HDL cholesterol, treatment with a statin, systolic BP, treatment for hypertension, history of diabetes, current smoker, aspirin therapy

Validated for adults 40-79 years of age.

http://tools.acc.org/ASCVD-Risk-Estimator/
APP Store: ASCVD Risk Estimator Plus
Case 1 (continued)

- 50 year-old male with no CVD
- No diabetes mellitus or chronic kidney disease
- Average office BP 135/86 mmHg

10-year ASCVD risk score = 5%

Recommended treatment?

Lifestyle modification
6. If Stage 1 hypertension and 10y ASCVD risk score <10%, initiate program of lifestyle intervention.

Nonpharmacological interventions are effective in lowering BP and often are sufficient to prevent hypertension or meet goal BP in managing patients with Stage 1 hypertension.
## LIFESTYLE MODIFICATION:
THE CORNERSTONE FOR PREVENTION AND TREATMENT OF HYPERTENSION

<table>
<thead>
<tr>
<th>Lifestyle Intervention</th>
<th>Dose</th>
<th>Impact on SBP Hypertension</th>
<th>Impact on SBP Normotension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.</td>
<td>-5 mm Hg</td>
<td>-2/3 mm Hg</td>
</tr>
<tr>
<td>Healthy diet</td>
<td>Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.</td>
<td>-11 mm Hg</td>
<td>-3 mm Hg</td>
</tr>
<tr>
<td>Reduced intake of dietary sodium</td>
<td>Optimal goal is &lt;1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.</td>
<td>-5/6 mm Hg</td>
<td>-2/3 mm Hg</td>
</tr>
<tr>
<td>Enhanced intake of dietary potassium</td>
<td>Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.</td>
<td>-4/5 mm Hg</td>
<td>-2 mm Hg</td>
</tr>
</tbody>
</table>

All 4 Recommendations COR:1; LOE:A
## Nonpharmacological Intervention

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Dose</th>
<th>Effect on SBP Hypertension</th>
<th>Effect on SBP Normotension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic</td>
<td>● 90–150 min/wk • 65%–75% heart rate reserve</td>
<td>-5/8 mm Hg</td>
<td>-2/4 mm Hg</td>
</tr>
<tr>
<td>Dynamic resistance</td>
<td>● 90–150 min/wk • 50%–80% 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set</td>
<td>-4 mm Hg</td>
<td>-2 mm Hg</td>
</tr>
<tr>
<td>Isometric resistance</td>
<td>● 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk • 8–10 wk</td>
<td>-5 mm Hg</td>
<td>-4 mm Hg</td>
</tr>
<tr>
<td><strong>Moderation in alcohol intake</strong></td>
<td>In individuals who drink alcohol, reduce alcohol to: • Men: ≤2 drinks daily • Women: ≤1 drink daily</td>
<td>-4 mm Hg</td>
<td>-3 mm</td>
</tr>
</tbody>
</table>

Both Recommendations COR:1; LOE:A
Case 2

54 year-old male with a history of obesity but no past cardiovascular disease, hypertension, diabetes or chronic kidney disease.

- 10-year ASCVD risk score = 12%
- Average office BP 134/84 mmHg

Recommended treatment?

Initiate lifestyle modification and antihypertensive drug therapy preferably with a single agent.
7. If Stage 1 hypertension with clinical ASCVD or ASCVD risk score ≥10%, initiate antihypertensive drug therapy in addition to lifestyle modification.

Lowering BP results in benefit in higher-risk individuals, regardless of their baseline treated or untreated BP ≥130/80 mmHg and irrespective of the specific cause of their elevated risk. Benefit of treatment outweighs potential harm at threshold BP ≥130/80 mmHg.
Case 3

40 year-old male with no history of cardiovascular disease, diabetes mellitus or chronic kidney disease.

- Average office BP 155/95 mmHg
- Ambulatory BP monitoring demonstrates average BP in the 148/94 to 150/98 mmHg range with absent nocturnal dipping.

Recommended treatment?

Initiate lifestyle modification and antihypertensive therapy with a combination of two agents of different pharmacologic classes.
8. If Stage 2 hypertension (BP $\geq 140/90$ mmHg), and BP $\geq 20/10$ mmHg above target, initiate 2 antihypertensive agents of different classes in addition to lifestyle modification.
BP THRESHOLDS AND RECOMMENDATIONS FOR TREATMENT AND FOLLOW UP

BP thresholds and recommendations for treatment and follow-up

- **Normal BP (BP <120/80 mm Hg)**
  - Promote optimal lifestyle habits (Class I)
  - Reassess in 1 y (Class IIa)

- **Elevated BP (BP 120-129/<80 mm Hg)**
  - Non-pharmacologic therapy (Class I)
  - Reassess in 3-6 mo (Class I)

- **Stage 1 Hypertension (BP 130-139/80-89 mm Hg)**
  - Non-pharmacologic therapy (Class I)
  - Reassess in 3-6 mo (Class I)

- **Stage 2 Hypertension (BP >140/90 mm Hg)**
  - Non-pharmacologic therapy and BP lowering medication (Class I)
  - Reassess in 1 mo (Class 1)

Clinical CVD or estimated 10 y ASCVD risk ≥ 10%

- **No**
  - Non-pharmacologic therapy and BP lowering medication (Class I)
  - Reassess in 1 mo (Class 1)

- **Yes**
  - Non-pharmacologic therapy and BP lowering medication (Class I)
  - Reassess in 1 mo (Class 1)
### 2017 ACC/AHA BP Guideline: Thresholds for Treatment

<table>
<thead>
<tr>
<th>SBP</th>
<th>DBP</th>
<th>CVD Risk/other circumstances</th>
<th>Recommended Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120 and &lt;80</td>
<td>(Normal)</td>
<td>N/A</td>
<td>Healthy Lifestyle</td>
</tr>
<tr>
<td>120–129 and &lt;80</td>
<td>(Elevated)</td>
<td>N/A</td>
<td>Nonpharmacological therapy</td>
</tr>
<tr>
<td>130-139 or 80-89</td>
<td>(Stage 1 Hypertension)</td>
<td>- No CVD</td>
<td>Nonpharmacological therapy</td>
</tr>
<tr>
<td>130-139</td>
<td>(Stage 1 Hypertension)</td>
<td>- 10-yr ASCVD risk &lt;10%*</td>
<td>Nonpharmacological therapy</td>
</tr>
<tr>
<td>≥140 or ≥90</td>
<td>(Stage 2 Hypertension)</td>
<td>- CVD, or</td>
<td>Nonpharmacological therapy and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 10-year ASCVD risk ≥ 10%</td>
<td>Antihypertensive drug therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diabetes or CKD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age ≥65 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

* AHA/ACC 2013 Pooled Cohort CVD Risk Equations

9. For initiation of antihypertensive drug therapy, first-line classes include thiazide diuretics, CCBs, and ACE inhibitors or ARBs.
10. Once antihypertensive drug therapy has been initiated, the therapeutic BP target is < 130/80 mmHg.

Meta-analyses of trials comparing more intense versus standard BP lowering show that more intense lowering significantly reduces risk of stroke, coronary events, major cardiovascular events and cardiovascular mortality.
### BP GOAL FOR PATIENTS WITH HYPERTENSION

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>SBP</th>
<th>DBP</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>B-R&lt;sup&gt;SR&lt;/sup&gt;</td>
<td>C-EO</td>
<td>1. For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk ≥10%, a BP target of &lt;130/80 mm Hg is recommended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIb</td>
<td></td>
<td>B-NR</td>
<td>C-EO</td>
<td>2. For adults with confirmed hypertension, without additional markers of increased CVD risk, a BP target of &lt;130/80 mm Hg may be reasonable.</td>
</tr>
</tbody>
</table>
## 2017 ACC/AHA BP Guideline: Treatment Targets

<table>
<thead>
<tr>
<th>SBP</th>
<th>DBP</th>
<th>CVD Risk</th>
<th>Recommended BP Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120</td>
<td>&lt;80</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>120–129</td>
<td>&lt;80</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>130–139</td>
<td>80–89</td>
<td>No CVD and 10-year ASCVD risk &lt;10%</td>
<td>SBP &lt;130 (DBP &lt;80 mm Hg)</td>
</tr>
<tr>
<td>130–139</td>
<td>80–89</td>
<td>Clinical CVD or 10-year ASCVD risk ≥ 10%</td>
<td>SBP &lt;130 mm Hg</td>
</tr>
<tr>
<td>≥130</td>
<td>≥80</td>
<td>Diabetes or CKD</td>
<td></td>
</tr>
<tr>
<td>≥140</td>
<td>≥90</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>≥130</td>
<td></td>
<td>Age ≥65 years</td>
<td></td>
</tr>
</tbody>
</table>

# Recommendations for Treatment of Hypertension in Older Persons

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A</td>
<td>Treatment of hypertension with a SBP treatment goal of &lt;130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 years of age) with an average SBP ≥130 mm Hg.</td>
</tr>
<tr>
<td>Ila</td>
<td>C-EO</td>
<td>For older adults (≥65 years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.</td>
</tr>
</tbody>
</table>
ASSOCIATION OF HYPERTENSION GUIDELINES WITH CVD EVENTS AND DEATH IN THE US

(1) Incidence of major CVD events & all-cause mortality by modeling 4 community-based cohort studies
(2) Network meta-analysis (42 RCTs) to estimate HRs for outcomes and determine population-attributable risks and events reduced

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>2014 Evidence-Based Guideline</th>
<th>2017 ACC/AHA Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP threshold for definition of hypertension</td>
<td>≥140/90</td>
<td>≥130/80</td>
</tr>
<tr>
<td>BP threshold for initiation of antihypertensive drugs</td>
<td>≥140/90 (&lt;age 60)</td>
<td>≥140/90 (gen. population)</td>
</tr>
<tr>
<td></td>
<td>≥150/90 (≥age 60)</td>
<td>≥130/80 (high CVD risk)</td>
</tr>
<tr>
<td>BP goal of treatment</td>
<td>&lt;140/90 (&lt;age 60)</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td></td>
<td>&lt;150/90 (≥age 60)</td>
<td></td>
</tr>
<tr>
<td>Annual CVD event reduction (adults ≥age 40)</td>
<td>270,000</td>
<td>610,000 (NNT=70)</td>
</tr>
<tr>
<td>Annual reduction in death (adults ≥age 40)</td>
<td>177,000</td>
<td>334,000 (NNT=129)</td>
</tr>
</tbody>
</table>

Bundy JD et al. JAMA Cardiol. 2018;doi:10.1001/jamacardio.2018.1240
• Hypertension is the world’s leading risk factor for cardiovascular disease and death.
• In preventing cardiovascular disease, the 2017 ACC/AHA hypertension clinical practice guidelines are of major critical importance.
• The guidelines are not a substitute for clinical judgement, but do provide an evidence-based guide to the detection, evaluation and management of high BP.
• Lowering BP according to guideline recommendations has been shown to prevent an increased number of cardiovascular events and death.
THANK YOU FOR YOUR KIND ATTENTION!