Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

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Summary of the Clinical Problem
Hypertension is a leading risk factor for mortality and disability. Recent estimates are that 874 million adults worldwide have an SBP of 140 mm Hg or higher.1,2 With its association with CVD, stroke (cerebrovascular accident [CVA]), heart failure, and chronic kidney disease (CKD), hypertension is second only to cigarette smoking as a preventable cause of death in the United States.3

Given demographic trends and the increasing prevalence of hypertension with increasing age (79% of men and 85% of women >75 years old have hypertension), the consequences of hypertension are expected to increase.1,2

Characteristics of the Guideline Source
This guideline was developed by the ACC and the AHA in partnership with other professional societies. The ACC/AHA Task Force on Clinical Practice Guidelines selected a writing committee that was notable for its inclusion of people with a breadth of backgrounds, wide scope of practice, and freedom from conflicts of interest. This writing committee reviewed the relevant evidence and commissioned an independent evidence review committee to conduct formal systematic reviews regarding 4 questions of critical importance. The guideline document was reviewed by individuals representing the partner specialty societies and other content reviewers. The writing committee was aware of any conflicts of interest among reviewers (Table).
Evidence Base

The guideline provides a comprehensive overview of the diagnosis and therapy of hypertension with 106 graded recommendations divided into 47 "modular knowledge chunks." The 8 recommendations covered in this JAMA Clinical Guidelines Synopsis were chosen for their clinical relevance.

This guideline recommends classifying BP into 4 categories: normal (<120/80 mm Hg); elevated (120-129/<80 mm Hg); stage 1 hypertension (130-139/80-89 mm Hg); and stage 2 hypertension (≥140/≥90 mm Hg). This categorization is designed to facilitate clinical and public health decision making and to reflect observational data suggesting a gradient in CVD risk as BP increases from normal to elevated to hypertension stages 1 and 2.1,2

In a change from current practice, the guideline recommends routine use of out-of-office BP measurements (home or ambulatory BP monitoring) in the diagnosis and treatment of hypertension. This recommendation reflects the known frequent inconsistencies between office and home BP values (there is extensive discussion of masked hypertension and white-coat hypertension in the guideline) and acknowledges that the tighter BP goals recommended in this guideline may require closer BP monitoring. The evidence for this recommendation was reviewed in one of the commissioned systematic reviews.6 Compared with usual care, patients using home BP monitoring had a greater reduction in office SBP at 6 months vs office-measured BP (4.9 [95% CI, 1.3-8.6] mm Hg). This result did not persist at 12 months. There was also no evidence of clinical benefit.

Nonpharmacologic interventions are strongly supported in the guideline for their primary and complementary effect in lowering BP. These interventions include weight loss in patients who are overweight or obese; a heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet; sodium reduction; potassium supplementation; increased physical activity; and moderation of alcohol consumption. Most of these interventions have been shown in randomized trials to reduce SBP by 5 to 10 mm Hg. Weight loss has been shown to decrease BP by about 1 mm Hg per l kg of weight loss.1,2 Adoption of the DASH diet yielded an 11-mm Hg decrease in SBP.5

Initiation of pharmacologic therapy for hypertension is recommended for patients with or at high risk of CVD at BP levels of 130/80 mm Hg or higher. Therapy is recommended for patients without and at low risk of CVD at 140/90 mm Hg or higher. To stratify risk, the guideline recommends using an ASCVD risk score (the estimated 10-year risk of myocardial infarction, CVA, or coronary heart disease death) of 10%. This risk stratification has been used in other recent hypertension guidelines (referenced in this guideline) and could help translate group-level evidence from trials to individual patients.6 The lower systolic threshold for individuals with or at high risk of CVD is well supported by data from a patient-level meta-analysis.7

The recommendation to initiate pharmacologic therapy in patients without and at low risk of CVD at BPs ≥140/90 is unchanged from the JNC 7 and JNC 8 recommendations. The evidence for this recommendation is strong but mostly indirect. The most direct evidence may come from a meta-analysis of patients without CVD and with BP levels of 140/90 to 159/99 mm Hg who were randomly assigned to an antihypertensive vs a control (placebo in 95%; less intensive regimen in 5%) BP-lowering regimen.8 The odds ratios for events over the 5 years in this study were 0.72 (95% CI, 0.55-0.94) for stroke, 0.75 (95% CI, 0.57-0.98) for cardiovascular death, and 0.78 (95% CI, 0.67-0.92) for overall mortality. Benefits for total cardiovascular events, coronary events, and heart failure did not reach statistical significance. Notably, the BP difference in this study between treatment and control groups was only 3.6/2.4 mm Hg and 96% of the patients had diabetes mellitus.

The appropriate target BP for high-risk patients with hypertension has been the subject of many large trials over the last decade. This was the focus of another systematic review commissioned for this guideline.4 In an analysis limited to trials that compared an SBP target of less than 130 mm Hg with any higher target, patients benefited in terms of major cardiovascular events (relative risk [RR], 0.84; 95% CI, 0.73-0.99) and stroke (RR, 0.82; 95% CI, 0.70-0.96) but not myocardial infarction (RR, 0.85; 95% CI, 0.73-1.00) or all-cause mortality (RR, 0.92; 95% CI, 0.79-1.06). Similar to the data on initiating therapy, very little information from clinical trials is available to guide recommendations about treating DBP. The recommendation for low-risk patients was graded as weak and was based on moderate-quality evidence and expert opinion (for SBP and DBP, respectively). There are few data on low-risk patients because trials that evaluate intensive BP control generally enroll high-risk patients who have comorbid conditions such as diabetes or CKD.

Recommendations regarding the choice of initial pharmacologic therapy for hypertension were based on another commissioned systematic review.4 The network meta-analysis examined trials that compared any 2 of the antihypertensive classes: thiazides, ACEIs, ARBs, CCBs, and β-blockers. A total of 152,379 patients were included in this meta-analysis, with an average of 3.5 years of follow-up. The meta-analysis found that in terms of all-cause mortality, all classes were similar. Analysis of secondary end points (such as CVA, cardiovascular events, and heart failure) demonstrated that thiazides had added benefit. The authors of the guideline recommended thiazide diuretics, CCBs, ACE inhibitors, or ARBs as first-line agents. Detailed recommendations are included for initial antihypertensive therapy for patients with numerous comorbidities including CAD, heart failure, CKD, acute stroke, and hypertensive emergency, among others.

The recommendation for the use of 2 first-line agents of different classes for patients with stage 2 hypertension remains unchanged since JNC 7. The recommendation rests on expert opinion based on studies using fixed-dose combinations that show greater BP lowering and better adherence to therapy with fixed-dose combinations.1,2

Benefits and Harms

From a public health perspective, considering the high population-attributable risk of CVD associated with hypertension, the potential benefits of tighter control of hypertension are substantial. The potential harms associated with the adoption of this guideline are the adverse

Table. Guideline Rating

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<th>Standard</th>
<th>Rating</th>
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<tr>
<td>Establishing transparency</td>
<td>Good</td>
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<tr>
<td>Management of conflict of interest in the guideline development group</td>
<td>Good</td>
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<tr>
<td>Guideline development group composition</td>
<td>Good</td>
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<tr>
<td>Clinical practice guideline–systematic review intersection</td>
<td>Fair</td>
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<tr>
<td>Establishing evidence foundations and rating strength for each of the guideline recommendations</td>
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<td>Articulation of recommendations</td>
<td>Good</td>
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<td>External review</td>
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effects of medications and tight BP and the costs of overuse (medication and home BP monitors) if the treatment thresholds and targets are shown to be overly aggressive. In the ACCORD trial, there was an increase in serious adverse events attributable to BP medications (3.3% vs 1.27%; P < .001). Although there was no overall increase in adverse events in the SPRINT trial, there were increases in hypertension (2.4% vs 1.4%; P < .001) and syncope (2.3% vs 1.7%; P = .05).

Discussion
Hypertension guidelines have substantially evolved since the publication of JNC 7 in 2003. The JNC 7 categorized stage 1 hypertension as a BP of 140-159/90-99 mm Hg and recommended 140/90 mm Hg as the threshold for initiation of antihypertensive drug therapy in the general adult population and 130/80 mm Hg or higher for patients with diabetes or CKD. The JNC 8, published in 2014, recommended that for people aged 60 years or older, pharmacologic therapy should be initiated at a BP of 150/90 mm Hg or higher and treated to a goal of less than that number. Recent randomized trials as well as observational and modeling studies support the idea that lower treatment thresholds and targets are beneficial in higher-risk patients, since progressively greater absolute risk reductions occur as baseline risk increases. Although studies do suggest that lower BP is better for most patients, including those older than 75 years, the balance of the potential benefits of hypertension management and medication costs, adverse effects, and polypharmacy must be considered for each individual patient. Shared decision making between patients and their clinicians is required to arrive at an optimal treatment plan for each patient. There is little high-quality evidence in the literature about some patient populations, most notably the frail elderly. Chobanian has recently commented on treatment in elderly persons. In addition, the guideline strongly supports team-based, electronic medical record, and population health approaches to BP control.

Areas in Need of Future Study or Ongoing Research
Future antihypertensive trials should be designed and adequately powered for clinical end points. Because lower BP is associated with better outcomes, future trials should refine knowledge regarding the balance between harms and benefits of BP treatment. This is especially true for stage 1 hypertension, for which there is little information regarding the balance between harms and benefits of treatment. Trials of multifaceted interventions that include out-of-office BP measurements are critical to understanding whether incorporating these measurements in management decisions will prove truly beneficial. Tailoring BP treatment thresholds to individual cardiovascular risk is attractive in that it could concentrate efforts on patients who will obtain the most benefit; however, it is possible that the greater complexity of applying guidelines based on ASCVD risk could undermine the expected benefit. Electronic health record support that calculates and trends individuals for ASCVD risk may reduce this burden in clinical practice and is a promising area for exploration.

Within-Guideline Resources
This extensive guideline includes multiple resources that are useful to the practicing physician. Some include:

- Table 18. Oral Antihypertensive Drugs (pp 94-96)
- Figure 10. Resistant Hypertension: Diagnosis, Evaluation, and Treatment (p 162)
- Figure 3. Screening for Secondary Hypertension (p 51)
- Table 10. Procedures for the Use of Home BP Monitoring (p 33)
- Section 9. Hypertension in Patients With Comorbidities (pp 108-147)

ARTICLE INFORMATION

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Published Online: November 20, 2017.

Conflict of Interest Disclosures: The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

REFERENCES