Hypertension and the JNC 8 Guidelines

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Wichita, KS 67218
Overview

• Definition, classification of hypertension (HTN)
• Goals of therapy
• Compelling indications
• Lifestyle modifications
• Treatment
Hypertension

• Persistent elevation of arterial blood pressure (BP)
• ~72 million Americans (31%) have BP > 140/90 mmHg
• Most patients asymptomatic
• Increasing prevalence with aging of population and epidemic of overweight/obesity

• Control of BP leads to a reduction in events
  – Approximately 50% reduction in heart failure
  – Approximately 40% reduction in stroke
  – Approximately 20-25% reduction in MI

Hypertension


Source: NCHS and NHLBI. NH indicates non-Hispanic.

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Roger VL et al. Published online in Circulation Dec. 15, 2010
# BP Control Rates

Trends in awareness, treatment, and control of high blood pressure in adults ages 18–74

## National Health and Nutrition Examination Survey, Percent

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Awareness</strong></td>
<td>51</td>
<td>73</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>31</td>
<td>55</td>
<td>54</td>
<td>59</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>10</td>
<td>29</td>
<td>27</td>
<td>34</td>
</tr>
</tbody>
</table>

Guidelines in measuring BP

- **Condition:**
  - Posture (sitting, supine, standing)
  - Circumstances (no caffeine, no smoking)

- **Equipment:**
  - Cuff size
  - Manometer

- **Technique:**
  - Number of readings
  - Performance
  - Recordings
"I'm going to take your blood pressure, so try to relax and not think about what a high reading might mean for your chances of living a long, healthy life."
Target-Organ Damage

- **Brain**: stroke, transient ischemic attack, dementia
- **Eyes**: retinopathy
- **Heart**: left ventricular hypertrophy, angina
- **Kidney**: chronic kidney disease
- **Peripheral Vasculature**: peripheral arterial disease
Brain

Infarction

Aneurysm
Brain
Retinopathy

Silver Wiring

Papilledema
This left ventricle is very thickened (slightly over 2 cm in thickness), but the rest of the heart is not greatly enlarged. This is typical for hypertensive heart disease. The hypertension creates a greater pressure load on the heart to induce the hypertrophy.
The left ventricle is markedly thickened in this patient with severe hypertension that was untreated for many years. The myocardial fibers have undergone hypertrophy.
Cardiac

- Cardiac events (HF, angina and strokes)
- Vascular (Heart, brain and peripheral vascular disease)
Etiology

• **Essential hypertension:**
  – > 90% of cases
  – hereditary component

• **Secondary hypertension:**
  – < 10% of cases
  – common causes: chronic kidney disease, renovascular disease
  – other causes: Rx drugs, street drugs, natural products, food, industrial chemicals
Causes of 2° Hypertension

- Diseases
  - chronic kidney disease
  - Cushing's syndrome
  - Coarctation of the aorta
  - obstructive sleep apnea
  - parathyroid disease
  - pheochromocytoma
  - primary aldosteronism
  - renovascular disease
  - thyroid disease
Causes of 2° Hypertension

• **Prescription drugs:**
  – NSAIDs, COX-2 inhibitors
  – venlafaxine
  – bupropion
  – bromocriptine
  – buspirone
  – carbamazepine
  – clozapine
  – ketamine
  – metoclopramide
Causes of 2° Hypertension

• **Situations:**
  – β-blocker or centrally acting α-agonists
    • when abruptly discontinued
  – β-blocker without α-blocker first when treating pheochromocytoma

• **Food substances:**
  – sodium
  – ethanol
  – Licorice
  – Energy drinks
Causes of 2° Hypertension

- Street drugs, other natural products:
  - cocaine
  - cocaine withdrawal
  - ephedra alkaloids (e.g., ma-huang)
  - “herbal ecstasy”
  - phenylpropanolamine analogs
  - nicotine withdrawal
  - anabolic steroids
  - narcotic withdrawal
  - methylphenidate
  - phencyclidine
  - ketamine
  - ergot-containing herbal products
  - St. John's wort
# JNC 7 Adult Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Systolic Blood Pressure (mmHg)</th>
<th>Diastolic Blood Pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Less than 120</td>
<td>and Less than 80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>or 80-89</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159</td>
<td>or 90-99</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥ 160</td>
<td>or ≥ 100</td>
</tr>
</tbody>
</table>

SYSTEMIC HYPERTENSION

- CLASSIFICATION
- OPTIMAL  <120  <80
- NORMAL    <130  <85
- HIGH NORMAL  130-139  85-89
Clinical Controversy

- White coat hypertension: elevated BP in clinic followed by normal BP reading at home
- Aggressive treatment of white coat hypertension is controversial
- Patients with white coat hypertension may have increased CV risk compared to those without such BP changes
Classification for Adults

• Classification based on average of ≥ 2 properly measured seated BP measurements from ≥ 2 clinical encounters

• If systolic & diastolic blood pressure values give different classifications, classify by highest category

• > 130/80 mmHg: above goal for patients with diabetes mellitus or chronic kidney disease

• Prehypertension: patients likely to develop hypertension
Clinical Controversy

• Ambulatory BP measurements may be more accurate & better predict target-organ damage than manual BP measurements using a sphygmomanometer in a clinic setting (gold standard)
  • many patients may be misdiagnosed, misclassified
  • poor technique, daily BP variability, white coat HTN
• Validated ambulatory BP monitoring: role in the routine HTN management unclear
Clinical Controversy

• Prehypertension: patients do not have HTN but at risk for developing it
• Trial of Preventing Hypertension (TROPHY) showed treating prehypertension with candesartan decreased progression to stage 1 hypertension
• Unknown whether managing prehypertension with drug therapy and lifestyle modifications decreases CV events or if this approach is cost-effective

Investigation of the New Hypertensive

- History and examination
- Exclude secondary Hypertension
- Urea and electrolytes
- FBS and ESR
- ECG
- Lipid profile
- Chest x-ray no longer routinely indicated
LABORATORY TESTS FOR HTN

• BASIC TESTS FOR INITIAL EVALUATION:
  • ALWAYS INCLUDED
  • USUALLY INCLUDED
  • SPECIAL STUDIES
LABORATORY TESTS FOR HTN

- ALWAYS INCLUDED TESTS:
  - URINE FOR PROTEIN, BLOOD, GLUCOSE.
  - MICROSCOPIC URINALYSIS.
  - HEMATOCRIT.
  - SERUM POTASSIUM.
  - SERUM CREATININE OR BUN.
  - FASTING GLUCOSE.
  - TOTAL CHOLESTROL.
  - EKG
LABORATORY TESTS FOR HTN

• USUALLY INCLUDED TESTS:
  • TSH
  • WBC
  • HDL, LDL, TG
  • SERUM CALC & PHOS
  • CHEST X RAY & ECHO


LABORATORY TESTS FOR HTN

- **SPECIAL STUDIES TO SCREEN FOR SECONDARY HTN:**
  - 1. RENOVASCULAR DISEASE:
  - ACE INHIBITOR RADIONUCLEIDE RENAL SCAN, RENAL DUPLEX DOPPLER FLOW STUDIES, MRI ANGIOGRAPHY.
  - 2. PHEOCHROMOCYTOMA:
  - 24-h URINE ASSAY FOR: CREATININE, METANEPHRINES, & CATHECH
LABORATORY TESTS FOR HTN

• SPECIAL STUDIES TO SCREEN FOR SECONDARY HTN:
  
  • 3. CUSHING SYNDROME:
  • OVERNIGHT DEXAMETHASONE
  • SUPPRESSION TEST.
  • 24-h URINE CORTISOL & CREATININE.
  
  • 4. PRIMARY ALDOSTRONISM:
  • PLASMA ALDOSTERONE:RENIN ACTIVITY
RISK FACTORS FOR ADVERSE PROGNOSIS IN HTN

• BLACK RACE
• YOUTH
• MALE GENDER
• SMOKING
• DM
• OBESITY
• ALCOHOL INTAKE
• HYPERCHOLESTEROLEMIA

• EVIDENCE OF END ORGAN DAMAGE (LVH, LVSTRAIN, MI, CHF)
• RETINAL HEMORRHAGE & EXUDATE
• PAPILLEDEMA
• RENAL: IMP REN FUN
• CVA
Treatment Goals

• Reduce morbidity & mortality
• Select drug therapy based on evidence demonstrating risk reduction

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>Target Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most patients</td>
<td>&lt; 140/90 mmHg</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>&lt; 130/80 mmHg</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>&lt; 130/80 mmHg</td>
</tr>
</tbody>
</table>

2007 AHA Recommendations

- More aggressive BP lowering for high risk patients

<table>
<thead>
<tr>
<th>Most patients for general prevention</th>
<th>&lt;140/90 mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with diabetes (CAD risk equivalent), significant CKD, known CAD (MI, stable angina, unstable angina), noncoronary atherosclerotic vascular disease (ischemic stroke, TIA, PAD, abdominal aortic aneurism [CAD risk equivalents]), Framingham risk score &gt; 10%</td>
<td>&lt;130/80 mmHg</td>
</tr>
<tr>
<td>Patients with left ventricular dysfunction (HF)</td>
<td>&lt;120/80 mmHg</td>
</tr>
</tbody>
</table>

ALLHAT

• Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT)

• Primary endpoints
  – fatal CHD
  – nonfatal MI

• Secondary endpoints
  – other hypertension-related complications
    • HF
    • stroke

• Prospective, double-blind trial
  – randomized patients to:
    • chlorthalidone
    • amlodipine
    • doxazosin
    • lisinopril-based therapy
  – 42,418 patients: age > 55 yr with HTN + 1 additional CV risk factor (mean subject participation 4.9 years)

• Thiazide-type diuretics remain unsurpassed for reducing CV morbidity & mortality in most patients

H O T

- Hypertension Optimal Treatment
- Largest intervention trial in hypertension. Published in 1998
- Conducted in General Practice. 18,790 patients in 26 countries
- Followed up for an average of 3.8 years
H O T Findings

• Lowest incidence of major CV events occurred at a mean achieved DBP of 83 mmhg. This target (compared to mean achieved of 105 mmHg) was associated with a 30% reduction in main CV events.

• In diabetes – Diastolic < or = 80mmhg ; 51 % lower risk compared to 90 mmHg
Hypertension and Diabetes

• Hypertension co-exists with type II in about 40% at age 45 rising to 60% at age 75.
• 70% of type II patients die from cardiovascular disease.
• At least 60% of patients will require 2 or 3 antihypertensive agents to achieve tight control.
JNC7 Recommendations

• Thiazide-like diuretics preferred 1st line therapy based on clinical trials showing morbidity & mortality reductions
  – ALLHAT confirms 1st line role of thiazide diuretics

• Compelling indications: comorbid conditions where specific drug therapies provide unique long-term benefits based on clinical trials
  – drug therapy recommendations are in combination with or in place of a thiazide diuretic

Clinical Controversy

- **Avoiding Cardiovascular Events through COMbination Therapy in Patients Living with Systolic Hypertension (ACCOMPLISH)**

- **Endpoint:** composite of death from CV causes, hospitalization for angina, nonfatal MI or stroke, coronary revascularization, & resuscitation after cardiac arrest

- **Prospective, double-blind, industry sponsored trial**
  - randomized patients to benazepril + amodipidine or benazepril + HCTZ
  - 11,506 patients with HTN & high CV risk

- **Combination benazepril + amlodipine superior to benazepril + HCTZ for reducing CV events in high risk patients**

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Compelling Indications

• Heart Failure
• Post Myocardial Infarction
• High Coronary Disease Risk
• Diabetes Mellitus
• Chronic Kidney Disease
• Recurrent Stroke Prevention
Recommendations & Evidence

• Strength of recommendations
  – A: good, B: moderate, C: poor

• Quality of evidence
  – 1: more than 1 properly randomized, controlled trial
  – 2: at least 1 well-designed clinical trial with randomization; cohort or case-controlled analytic studies; dramatic results from uncontrolled experiments or subgroup analyses
  – 3: opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert communities

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## Effects of different blood-pressure-lowering regimens on major cardiovascular events: results of prospectively-designed overviews of randomised trials

<table>
<thead>
<tr>
<th></th>
<th>Trials</th>
<th>Events/participants</th>
<th>Difference in BP* (mean, mm Hg)</th>
<th>Relative risk</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stroke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{32-35,44})</td>
<td>5</td>
<td>984/20 195</td>
<td>1178/26 358 +2/0</td>
<td>1.09 (1.00–1.18)</td>
<td>0.13</td>
</tr>
<tr>
<td>CA vs D/BB(^{16,25,32-35,40})</td>
<td>9</td>
<td>999/31 031</td>
<td>1358/37 418 +1/0</td>
<td>0.93 (0.86–1.00)</td>
<td>0.67</td>
</tr>
<tr>
<td>ACEI vs CA(^{30-32,35,41})</td>
<td>5</td>
<td>701/12 562</td>
<td>622/12 541 +1/+1</td>
<td>1.12 (1.01–1.25)</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Coronary heart disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{32-35,44})</td>
<td>5</td>
<td>1172/20 195</td>
<td>1658/26 358 +2/0</td>
<td>0.98 (0.91–1.05)</td>
<td>0.21</td>
</tr>
<tr>
<td>CA vs D/BB(^{16,25,32-35,40})</td>
<td>9</td>
<td>1394/31 031</td>
<td>1840/37 418 +1/0</td>
<td>1.01 (0.94–1.08)</td>
<td>0.48</td>
</tr>
<tr>
<td>ACEI vs CA(^{30-32,35,41})</td>
<td>5</td>
<td>907/12 562</td>
<td>948/12 541 +1/+1</td>
<td>0.96 (0.88–1.04)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Heart failure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{32,33,44})</td>
<td>3</td>
<td>547/12 498</td>
<td>809/18 652 +2/0</td>
<td>1.07 (0.96–1.19)</td>
<td>0.43</td>
</tr>
<tr>
<td>CA vs D/BB(^{18,25,32-35,40})</td>
<td>7</td>
<td>732/23 425</td>
<td>850/29 734 +1/0</td>
<td>1.33 (1.21–1.47)</td>
<td>0.92</td>
</tr>
<tr>
<td>ACEI vs CA(^{30-32,41})</td>
<td>4</td>
<td>502/10 357</td>
<td>609/10 345 +1/+1</td>
<td>0.82 (0.73–0.92)</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Major cardiovascular events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{29,32-35,44})</td>
<td>6</td>
<td>2581/20 631</td>
<td>3450/26 799 +2/0</td>
<td>1.02 (0.98–1.07)</td>
<td>0.31</td>
</tr>
<tr>
<td>CA vs D/BB(^{18,25,32-35,40})</td>
<td>9</td>
<td>2998/31 031</td>
<td>3839/37 418 +1/0</td>
<td>1.04 (1.00,1.09)</td>
<td>0.92</td>
</tr>
<tr>
<td>ACEI vs CA(^{30-32,41})</td>
<td>5</td>
<td>1953/12 562</td>
<td>2011/12 541 +1/+1</td>
<td>0.97 (0.92–1.03)</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Cardiovascular death</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{29,32-35,44})</td>
<td>6</td>
<td>1061/20 631</td>
<td>1440/26 799 +2/0</td>
<td>1.03 (0.95–1.11)</td>
<td>0.36</td>
</tr>
<tr>
<td>CA vs D/BB(^{18,25,32-35,40})</td>
<td>9</td>
<td>1237/31 031</td>
<td>1584/37 418 +1/0</td>
<td>1.05 (0.97–1.13)</td>
<td>0.33</td>
</tr>
<tr>
<td>ACEI vs CA(^{30-32,41})</td>
<td>5</td>
<td>870/12 562</td>
<td>840/12 541 +1/+1</td>
<td>1.03 (0.94–1.13)</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>Total mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACEI vs D/BB(^{29,32-35,43})</td>
<td>6</td>
<td>2176/20 631</td>
<td>3067/26 799 +2/0</td>
<td>1.00 (0.95–1.05)</td>
<td>0.76</td>
</tr>
<tr>
<td>CA vs D/BB(^{18,25,32-35,40})</td>
<td>9</td>
<td>2527/31 031</td>
<td>3437/37 418 +1/0</td>
<td>0.99 (0.95–1.04)</td>
<td>0.71</td>
</tr>
<tr>
<td>ACEI vs CA26(^{29-32,35,41})</td>
<td>6</td>
<td>1763/12 998</td>
<td>1683/12 758 +1/+1</td>
<td>1.04 (0.98–1.10)</td>
<td>0.68</td>
</tr>
</tbody>
</table>


http://dx.doi.org/10.1016/S0140-6736(03)14739-3
<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Approximate Systolic Blood Pressure Reduction (mm Hg)(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>Maintain normal body weight (body mass index 18.5–24.9 kg/m(^2))</td>
<td>5–20 per 10-kg weight loss</td>
</tr>
<tr>
<td>DASH-type dietary patterns</td>
<td>Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat</td>
<td></td>
</tr>
<tr>
<td>Reduced salt intake</td>
<td>Reduce daily dietary sodium intake as much as possible, ideally to 65 mmol/day (1.5 g/day sodium, or 3.8 g/day sodium chloride)</td>
<td>8–14</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Regular aerobic physical activity (at least 30 min/day, most days of the week)</td>
<td>4–9</td>
</tr>
<tr>
<td>Moderation of alcohol intake</td>
<td>Limit consumption to 2 drinks/day in men and 1 drink/day in women and lighter-weight persons</td>
<td>2–4</td>
</tr>
</tbody>
</table>

DASH, Dietary Approaches to Stop Hypertension.
\(^a\) Effects of implementing these modifications are time and dose dependent and could be greater for some patients.
It is possible to change eating habits....
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
JNC 8 “Cliff Notes”

- Treat to 150/90 mm Hg in patients over age 60 and 140/90 for everybody else.
- Any of 4 classes of drugs could be chosen.
- Destination is important and not the journey.
- No stages please.
- In blacks C and D
EIGHTH JOINT NATIONAL COMMITTEE (JNC 8)

THRESHOLDS
GOALS
DRUG CLASSES
1. GENERAL POPULATION GREATER THAN 60
   150/90
   NO NEED FOR ADJUSTMENT IF LOWER WITH NO ADVERSE AFFECTS

2. GENERAL POPULATION <60

3. GENERAL POPULATION <60

4. > 18 WITH CKD
   140/90

5. > 18 WITH DIABETES

6. THIAZIDES, CA CHANNEL BLOCKERS, ACE INHIBITORS AND ARBS
   (GENERAL NONBLACK POPULATION)

7. (GENERAL BLACK POPULATION) THIAZIDE AND/OR A CA CHANNEL BLOCKER

8. CKD >18 USE AN ACE INHIBITOR OR AN ARB

9. INITIATING AND UPTITRATING OF MEDICATIONS
   AFTER 1 MONTH INCREASE DOSE  ADD 2ND OR 3RD DRUG
   NO ACES AND ARBS TOGETHER
   NONRECOMMENDED DRUGS
   REFERAL TO SPECIALIST
   LIFESTYLE MODIFICATIONS
Cuban doctors get pay raise to $67 per month

Havana - Cuba is giving its hundreds of thousands of medical workers raises that in some cases exceed 100 percent, official media on the island announced Friday, though pay remains much lower than what medical professionals earn elsewhere.

click here for more
1. In adults with hypertension, does initiating antihypertensive pharmacologic therapy at specific BP thresholds improve health outcomes?

2. In adults with hypertension, does treatment with antihypertensive pharmacologic therapy to a specified BP goal lead to improvements in health outcomes?

3. In adults with hypertension, do various antihypertensive drugs or drug classes differ in comparative benefits and harms on specific health outcomes?
Hypertension is the most common condition seen in primary care and leads to myocardial infarction, stroke, renal failure, and death if not detected early and treated appropriately.

Patients want to be assured that blood pressure (BP) treatment will reduce their disease burden, while clinicians want guidance on hypertension management using the best scientific evidence.

This report takes a rigorous, evidence-based approach to recommend treatment thresholds, goals, and medications in the management of hypertension in adults.

Evidence was drawn from randomized controlled trials, which represent the gold standard for determining efficacy and effectiveness.

Evidence quality and recommendations were graded based on their effect on important outcomes.
<table>
<thead>
<tr>
<th>Topic</th>
<th>JNC 7</th>
<th>2014 Hypertension Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodology</td>
<td>Nonsystematic literature review by expert committee including a</td>
<td>Critical questions and review criteria defined by expert panel with input from methodology team Initial systematic review by methodologists restricted to RCT evidence Subsequent review of RCT evidence and recommendations by the panel according to a standardized protocol</td>
</tr>
<tr>
<td></td>
<td>range of study designs Recommendations based on consensus</td>
<td></td>
</tr>
<tr>
<td>Definitions</td>
<td>Defined hypertension and prehypertension</td>
<td>Definitions of hypertension and prehypertension not addressed, but thresholds for pharmacologic treatment were defined</td>
</tr>
<tr>
<td>Treatment goals</td>
<td>Separate treatment goals defined for “uncomplicated” hypertension</td>
<td>Similar treatment goals defined for all hypertensive populations except when evidence review supports different goals for a particular subgroup</td>
</tr>
<tr>
<td></td>
<td>and for subsets with various comorbid conditions (diabetes and CKD)</td>
<td></td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Recommended lifestyle modifications based on literature review and</td>
<td>Lifestyle modifications recommended by endorsing the evidence-based Recommendations of the Lifestyle Work Group</td>
</tr>
<tr>
<td>recommendations</td>
<td>expert opinion</td>
<td></td>
</tr>
<tr>
<td>Drug therapy</td>
<td>Recommended 5 classes to be considered as initial therapy but</td>
<td>Recommended selection among 4 specific medication classes (ACEI or ARB, CCB or diuretics) and doses based on RCT evidence Recommended specific medication classes based on evidence review for racial, CKD, and diabetic subgroups Panel created a table of drugs and doses used in the outcome trials</td>
</tr>
<tr>
<td></td>
<td>recommended thiazide-type diuretics as initial therapy for most patients without compelling indication for another class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Specified particular antihypertensive medication classes for patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with compelling indications, ie, diabetes, CKD, heart failure, myocardial infarction, stroke, and high CVD risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Included a comprehensive table of oral antihypertensive drugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>including names and usual dose ranges</td>
<td></td>
</tr>
<tr>
<td>Scope of topics</td>
<td>Addressed multiple issues (blood pressure measurement methods, patient evaluation components, secondary hypertension, adherence to regimens, resistant hypertension, and hypertension in special populations) based on literature review and expert opinion</td>
<td>Evidence review of RCTs addressed a limited number of questions, those judged by the panel to be of highest priority.</td>
</tr>
<tr>
<td>Review process prior to</td>
<td>Reviewed by the National High Blood Pressure Education Program</td>
<td>Reviewed by experts including those affiliated with professional and public organizations and federal agencies; no official sponsorship by any organization should be inferred</td>
</tr>
<tr>
<td>publication</td>
<td>Coordinating Committee, a coalition of 39 major professional, public,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and voluntary organizations and 7 federal agencies</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CCB, calcium channel blocker; CKD, chronic kidney disease; CVD, cardiovascular disease; JNC, Joint National Committee; RCT, randomized controlled trial
<table>
<thead>
<tr>
<th>Grade</th>
<th>Strength of Recommendation</th>
</tr>
</thead>
</table>
| A     | Strong Recommendation  
There is high certainty based on evidence that the net benefit\(^a\) is substantial.                                                               |
| B     | Moderate Recommendation  
There is moderate certainty based on evidence that the net benefit is moderate to substantial or there is high certainty that the net benefit is moderate. |
| C     | Weak Recommendation  
There is at least moderate certainty based on evidence that there is a small net benefit.                                                             |
| D     | Recommendation against  
There is at least moderate certainty based on evidence that it has no net benefit or that risks/harms outweigh benefits.                     |
| E     | Expert Opinion (“There is insufficient evidence or evidence is unclear or conflicting, but this is what the committee recommends.”)  
Net benefit is unclear. Balance of benefits and harms cannot be determined because of no evidence, insufficient evidence, unclear evidence, or conflicting evidence, but the committee thought it was important to provide clinical guidance and make a recommendation. Further research is recommended in this area. |
| N     | No Recommendation for or against (“There is insufficient evidence or evidence is unclear or conflicting.”)  
Net benefit is unclear. Balance of benefits and harms cannot be determined because of no evidence, insufficient evidence, unclear evidence, or conflicting evidence, and the committee thought no recommendation should be made. Further research is recommended in this area. |
Recommendation 1

- In the general population aged 60 years or older, initiate pharmacologic treatment to lower BP at systolic blood pressure (SBP) of 150 mm Hg or higher or diastolic blood pressure (DBP) of 90 mm Hg or higher and treat to a goal SBP lower than 150 mm Hg and goal DBP lower than 90 mm Hg.
  - Strong Recommendation – Grade A

- Corollary Recommendation
  - In the general population aged 60 years or older, if pharmacologic treatment for high BP results in lower achieved SBP (for example, <140 mm Hg) and treatment is not associated with adverse effects on health or quality of life, treatment does not need to be adjusted. Expert Opinion – Grade E
Recommendation 1

- There is moderate to high quality evidence from RCTs that in the general population aged 60 years or older, treating high BP to a goal of lower than 150/90 mm Hg reduces stroke, heart failure, and coronary heart disease (CHD).

- There is also evidence (albeit low quality) that setting a goal SBP of lower than 140 mm Hg in this age group provides no additional benefit compared with a higher goal SBP of 140 to 160 mm Hg or 140 to 149 mm Hg.
Recommendation 1

- The corollary to recommendation 1 reflects that there are many treated hypertensive patients aged 60 years or older in whom SBP is currently lower than 140 mm Hg, based on implementation of previous guideline recommendations. The panel’s opinion is that in these patients, it is not necessary to adjust medication to allow BP to increase.
Recommendation 2

- In the general population younger than 60 years, initiate pharmacologic treatment to lower BP at DBP of 90 mm Hg or higher and treat to a goal DBP of lower than 90 mm Hg. For ages 30 through 59 years, Strong Recommendation – Grade A

- For ages 18 through 29 years, Expert Opinion – Grade E
Recommendation 2

• Initiation of antihypertensive treatment at a DBP threshold of 90 mm Hg or higher and treatment to a DBP goal of lower than 90 mm Hg reduces cerebrovascular events, heart failure, and overall mortality.

• In further support for a DBP goal of lower than 90 mm Hg, the panel found evidence that there is no benefit in treating patients to a goal of either 80 mm Hg or lower or 85 mm Hg or lower compared with 90 mm Hg or lower based on the HOT trial, in which patients were randomized to these 3 goals without statistically significant differences between treatment groups in the primary or secondary outcomes.
Recommendation 2

- In adults younger than 30 years, there are no good- or fair quality RCTs that assessed the benefits of treating elevated DBP on health outcomes.

- In the absence of such evidence, it is the panel’s opinion that in adults younger than 30 years, the DBP threshold and goal should be the same as in adults 30 through 59 years of age.
Recommendation 3

• In the general population younger than 60 years, initiate pharmacologic treatment to lower BP at SBP of 140 mm Hg or higher and treat to a goal SBP of lower than 140 mm Hg.

Expert Opinion – Grade E
Recommendation 3

• While there is high-quality evidence to support a specific SBP threshold and goal for persons aged 60 years or older, the panel found insufficient evidence from good- or fair-quality RCTs to support a specific SBP threshold or goal for persons younger than 60 years.

• In the absence of such evidence, the panel recommends an SBP treatment threshold of 140 mm Hg or higher and an SBP treatment goal of lower than 140 mm Hg based on several factors.
Recommendation 3

• First, in the absence of any RCTs that compared the current SBP standard of 140 mm Hg with another higher or lower standard in this age group, there was no compelling reason to change current recommendations.

• Second, in the DBP trials that demonstrated the benefit of treating DBP to lower than 90 mm Hg, many of the study participants who achieved DBP of lower than 90 mm Hg were also likely to have achieved SBPs of lower than 140 mm Hg with treatment. It is not possible to determine whether the outcome benefits in these trials were due to lowering DBP, SBP, or both.

• Third, given the recommended SBP goal of lower than 140 mm Hg in adults with diabetes or CKD (recommendations 4 and 5), a similar SBP goal for the general population younger than 60 years may facilitate guideline implementation.
Recommendation 4

- In the population aged 18 years or older with CKD, initiate pharmacologic treatment to lower BP at SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher and treat to goal SBP of lower than 140 mm Hg and goal DBP lower than 90 mm Hg.

- Expert Opinion – Grade E
Recommendation 4

- Recommendation applies to individuals younger than 70 years with an estimated GFR or measured GFR less than 60 mL/min/1.73 m² and in people of any age with albuminuria defined as greater than 30 mg of albumin/g of creatinine at any level of GFR.

- No benefit in mortality, or cardiovascular or cerebrovascular health outcomes with antihypertensive drug therapy to a lower BP goal

- Evidence of moderate quality demonstrating no benefit in delaying renal progression by further lowering BP.
Recommendation 4

- The panel cannot make a recommendation for a BP goal for people aged 70 years or older with GFR less than 60 mL/min/1.73m$^2$
- No outcome trials reviewed by the panel included large numbers of adults older than 70 years with CKD.
- Antihypertensive treatment should be individualized, taking into consideration factors such as frailty, comorbidities, and albuminuria.
Recommendation 5

- In the population aged 18 years or older with diabetes, initiate pharmacologic treatment to lower BP at SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher and treat to a goal SBP of lower than 140 mm Hg and goal DBP lower than 90 mm Hg.

- Expert Opinion – Grade E
Recommendation 5

- There is moderate-quality evidence from 3 trials (SHEP, Syst-Eur, and UKPDS) that treatment to an SBP goal of lower than 150 mm Hg improves cardiovascular and cerebrovascular health outcomes and lowers mortality in adults with diabetes and hypertension.

- The panel also recognizes that an SBP goal of lower than 130 mm Hg is commonly recommended for adults with diabetes and hypertension. However, this lower SBP goal is not supported by any RCT that randomized participants into 2 or more groups in which treatment was initiated at a lower SBP threshold than 140 mm Hg or into treatment groups in which the SBP goal was lower than 140 mm Hg and that assessed the effects of a lower SBP threshold or goal on important health outcomes.
Recommendation 6

• In the general nonblack population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic, calcium channel blocker (CCB), angiotensin-converting enzyme inhibitor (ACEI), or angiotensin receptor blocker (ARB). Moderate Recommendation – Grade B
Recommendation 6

• Each of the 4 drug classes recommended by the panel in recommendation 6 yielded comparable effects on overall mortality and cardiovascular, cerebrovascular, and kidney outcomes, with one exception: heart failure.

• Initial treatment with a thiazide-type diuretic was more effective than a CCB or ACEI and an ACEI was more effective than a CCB in improving heart failure outcomes.
Recommendation 6

• The panel did not recommend β-blockers for the initial treatment of hypertension because in one study use of β-blockers resulted in a higher rate of the primary composite outcome of cardiovascular death, myocardial infarction, or stroke compared to use of an ARB, a finding that was driven largely by an increase in stroke. In the other studies that compared a β-blocker to the 4 recommended drug classes, the β-blocker performed similarly to the other drugs.

• α-Blockers were not recommended as first-line therapy because in one study initial treatment with an α-blocker resulted in worse cerebrovascular, heart failure, and combined cardiovascular outcomes than initial treatment with a diuretic.
Recommendation 6

- There were no RCTs of good or fair quality comparing the following drug classes to the 4 recommended classes: dual α1-+ β-blocking agents (eg, carvedilol), vasodilating β-blockers (eg, nebivolol), central α2-adrenergic agonists (eg, clonidine), direct vasodilators (eg, hydralazine), aldosterone receptor antagonists (eg, spironolactone), peripherally acting adrenergic antagonists (reserpine), and loop diuretics (eg, furosemide). Therefore, these drug classes are not recommended as first-line therapy.
Recommendation 6

• Recommendation also applies to those with diabetes.

• First, many people will require treatment with more than one antihypertensive drug to achieve BP control. While this recommendation applies only to the choice of the initial antihypertensive drug, the panel suggests that any of these 4 classes would be good choices as add-on agents (recommendation 9).

• Second, this recommendation is specific for thiazide-type diuretics, which include thiazide diuretics, chlorthalidone, and indapamide; it does not include loop or potassium-sparing diuretics.

• Third, it is important that medications be dosed adequately to achieve results similar to those seen in the RCTs (Table 4).

• Fourth, RCTs that were limited to specific nonhypertensive populations, such as those with coronary artery disease or heart failure, were not reviewed for this recommendation. Therefore, recommendation 6 should be applied with caution to these populations.
<table>
<thead>
<tr>
<th>Antihypertensive Medication</th>
<th>Initial Daily Dose, mg</th>
<th>Target Dose in RCTs Reviewed, mg</th>
<th>No. of Doses per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Captopril</td>
<td>50</td>
<td>150-200</td>
<td>2</td>
</tr>
<tr>
<td>Enalapril</td>
<td>5</td>
<td>20</td>
<td>1-2</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>10</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Angiotensin receptor blockers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eprosartan</td>
<td>400</td>
<td>600-800</td>
<td>1-2</td>
</tr>
<tr>
<td>Candesartan</td>
<td>4</td>
<td>12-32</td>
<td>1</td>
</tr>
<tr>
<td>Losartan</td>
<td>50</td>
<td>100</td>
<td>1-2</td>
</tr>
<tr>
<td>Valsartan</td>
<td>40-80</td>
<td>160-320</td>
<td>1</td>
</tr>
<tr>
<td>Irbesartan</td>
<td>75</td>
<td>300</td>
<td>1</td>
</tr>
<tr>
<td>β-Blockers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atenolol</td>
<td>25-50</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>50</td>
<td>100-200</td>
<td>1-2</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amlodipine</td>
<td>2.5</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Diltiazem extended release</td>
<td>120-180</td>
<td>360</td>
<td>1</td>
</tr>
<tr>
<td>Nitrendipine</td>
<td>10</td>
<td>20</td>
<td>1-2</td>
</tr>
<tr>
<td>Thiazide-type diuretics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bendroflumethiazide</td>
<td>5</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Chlorthalidone</td>
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<td>12.5-25</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochlorothiazide</td>
<td>12.5-25</td>
<td>25-100a</td>
<td>1-2</td>
</tr>
<tr>
<td>Indapamide</td>
<td>1.25</td>
<td>1.25-2.5</td>
<td>1</td>
</tr>
</tbody>
</table>
Recommendation 7

• In the general black population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
For general black population: Moderate Recommendation – Grade B For black patients with diabetes: Weak Recommendation – Grade C
Recommendation 8

- In the population aged 18 years or older with CKD and hypertension, initial (or add-on) antihypertensive treatment should include an ACEI or ARB to improve kidney outcomes. This applies to all CKD patients with hypertension regardless of race or diabetes status. Moderate Recommendation – Grade B
Recommendation 8

- Evidence is moderate that treatment with an ACEI or ARB improves kidney outcomes for patients with CKD. This recommendation applies to CKD patients with and without proteinuria, as studies using ACEIs or ARBs showed evidence of improved kidney outcomes in both groups.

- This recommendation is based primarily on kidney outcomes because there is less evidence favoring ACEI or ARB for cardiovascular outcomes in patients with CKD.

- Recommendation 8 applies to adults aged 18 years or older with CKD, but there is no evidence to support renin-angiotensin system inhibitor treatment in those older than 75 years. Although treatment with an ACEI or ARB may be beneficial in those older than 75 years, use of a thiazide-type diuretic or CCB is also an option for individuals with CKD in this age group.
Recommendation 9

- The main objective of hypertension treatment is to attain and maintain goal BP. If goal BP is not reached within a month of treatment, increase the dose of the initial drug or add a second drug from one of the classes in recommendation 6 (thiazide-type diuretic, CCB, ACEI, or ARB). The clinician should continue to assess BP and adjust the treatment regimen until goal BP is reached. If goal BP cannot be reached with 2 drugs, add and titrate a third drug from the list provided. Do not use an ACEI and an ARB together in the same patient. If goal BP cannot be reached using the drugs in recommendation 6 because of a contraindication or the need to use more than 3 drugs to reach goal BP, anti-hypertensive drugs from other classes can be used. Referral to a hypertension specialist may be indicated for patients in whom goal BP cannot be attained using the above strategy or for the management of complicated patients for whom additional clinical consultation is needed.

- Expert Opinion – Grade E
Recommendation 9

• How should clinicians titrate and combine the drugs recommended in this report? There were no RCTs and thus the panel relied on expert opinion. Three strategies (Table 5) have been used in RCTs of high BP treatment but were not compared with each other.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Start one drug, titrate to maximum dose, and then add a second drug</td>
<td>If goal BP is not achieved with the initial drug, titrate the dose of the initial drug up to the maximum recommended dose to achieve goal BP. If goal BP is not achieved with the use of one drug despite titration to the maximum recommended dose, add a second drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB) and titrate up to the maximum recommended dose of the second drug to achieve goal BP. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose to achieve goal BP.</td>
</tr>
<tr>
<td>B</td>
<td>Start one drug and then add a second drug before achieving maximum dose of the initial drug</td>
<td>Start with one drug then add a second drug before achieving the maximum recommended dose of the initial drug, then titrate both drugs up to the maximum recommended doses of both to achieve goal BP. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose to achieve goal BP.</td>
</tr>
<tr>
<td>C</td>
<td>Begin with 2 drugs at the same time, either as 2 separate pills or as a single pill combination</td>
<td>Initiate therapy with 2 drugs simultaneously, either as 2 separate drugs or as a single pill combination. Some committee members recommend starting therapy with ≥2 drugs when SBP is &gt;160 mm Hg and/or DBP is &gt;100 mm Hg, or if SBP is &gt;20 mm Hg above goal and/or DBP is &gt;10 mm Hg above goal. If goal BP is not achieved with 2 drugs, select a third drug from the list (thiazide-type diuretic, CCB, ACEI, or ARB), avoiding the combined use of ACEI and ARB. Titrate the third drug up to the maximum recommended dose.</td>
</tr>
</tbody>
</table>

Abbreviations: ACEI, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; CCB, calcium channel blocker; DBP, diastolic blood pressure; SBP, systolic blood pressure.
Recommendation 8

- Each strategy is an acceptable pharmacologic treatment strategy that can be tailored based on individual circumstances, clinician and patient preferences, and drug tolerability. With each strategy, clinicians should regularly assess BP, encourage evidence-based lifestyle and adherence interventions, and adjust treatment until goal BP is attained and maintained.
Adult aged ≥18 years with hypertension

Implement lifestyle interventions (continue throughout management).

Set blood pressure goal and initiate blood pressure lowering—medication based on age, diabetes, and chronic kidney disease (CKD).

General population (no diabetes or CKD)  Diabetes or CKD present

Age ≥60 years  Age <60 years

Blood pressure goal SBP <150 mm Hg  Blood pressure goal SBP <140 mm Hg
DBP <90 mm Hg  DBP <90 mm Hg

Nonblack  Black

Initiate thiazide-type diuretic or ACEI or ARB or CCB, alone or in combination.¹

Select a drug treatment titration strategy
A. Maximize first medication before adding second or
B. Add second medication before reaching maximum dose of first medication or
C. Start with 2 medication classes separately or as fixed-dose combination.

At goal blood pressure?

Yes

Reinforce medication and lifestyle adherence.
For strategies A and B, add and titrate thiazide-type diuretic or ACEI or ARB or CCB (use medication class not previously selected and avoid combined use of ACEI and ARB).
For strategy C, titrate doses of initial medications to maximum.

At goal blood pressure?

No

No

Reinforce medication and lifestyle adherence.
Add and titrate thiazide-type diuretic or ACEI or ARB or CCB (use medication class not previously selected and avoid combined use of ACEI and ARB).

At goal blood pressure?

Yes

Add additional medication class (eg, β-blocker, aldosterone antagonist, or others) and/or refer to physician with expertise in hypertension management.

No

Continue current treatment and monitoring.²
<table>
<thead>
<tr>
<th>Guideline</th>
<th>Population</th>
<th>Goal BP, mm Hg</th>
<th>Initial Drug Treatment Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Hypertension guideline</td>
<td>General ≥60 y</td>
<td>&lt;150/90</td>
<td>Nonblack: thiazide-type diuretic, ACEI, ARB, or CCB</td>
</tr>
<tr>
<td></td>
<td>General &lt;60 y</td>
<td>&lt;140/90</td>
<td>Black: thiazide-type diuretic or CCB</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>&lt;140/90</td>
<td>Thiazide-type diuretic, ACEI, ARB, or CCB</td>
</tr>
<tr>
<td></td>
<td>CKD</td>
<td>&lt;140/90</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td>ESH/ESC 2013 (^{37})</td>
<td>General nonelderly</td>
<td>&lt;140/90</td>
<td>β-Blocker, diuretic, CCB, ACEI, or ARB</td>
</tr>
<tr>
<td></td>
<td>General elderly &lt;80 y</td>
<td>&lt;150/90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General ≥80 y</td>
<td>&lt;150/90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>&lt;140/85</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td></td>
<td>CKD no proteinuria</td>
<td>&lt;140/90</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td></td>
<td>CKD + proteinuria</td>
<td>&lt;130/90</td>
<td></td>
</tr>
<tr>
<td>CHEP 2013 (^{38})</td>
<td>General &lt;80 y</td>
<td>&lt;140/90</td>
<td>Thiazide, β-blocker (age &lt;60y), ACEI (nonblack), or ARB</td>
</tr>
<tr>
<td></td>
<td>General ≥80 y</td>
<td>&lt;150/90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>&lt;130/80</td>
<td>ACEI or ARB with additional CVD risk ACEI, ARB, thiazide, or DHPCCB without additional CVD risk</td>
</tr>
<tr>
<td></td>
<td>CKD</td>
<td>&lt;140/90</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td>ADA 2013 (^{39})</td>
<td>Diabetes</td>
<td>&lt;140/80</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td>KDIGO 2012 (^{40})</td>
<td>CKD no proteinuria</td>
<td>≤140/90</td>
<td>ACEI or ARB</td>
</tr>
<tr>
<td></td>
<td>CKD + proteinuria</td>
<td>≤130/80</td>
<td></td>
</tr>
<tr>
<td>NICE 2011 (^{41})</td>
<td>General &lt;80 y</td>
<td>&lt;140/90</td>
<td>&lt;55 y: ACEI or ARB</td>
</tr>
<tr>
<td></td>
<td>General ≥80 y</td>
<td>&lt;150/90</td>
<td>≥55 y or black: CCB</td>
</tr>
<tr>
<td>ISHIB 2010 (^{42})</td>
<td>Black, lower risk</td>
<td>&lt;135/85</td>
<td>Diuretic or CCB</td>
</tr>
<tr>
<td></td>
<td>Target organ damage or CVD risk</td>
<td>&lt;130/80</td>
<td></td>
</tr>
</tbody>
</table>
Limitations

- This evidence-based guideline for the management of high BP in adults is not a comprehensive guideline and is limited in scope because of the focused evidence review to address the 3 specific questions.

- Treatment adherence and medication costs were thought to be beyond the scope of this review, but the panel acknowledges the importance of both issues.

- Panel relied upon RCTs alone.
• Many of the reviewed studies were conducted when the overall risk of cardiovascular morbidity and mortality was substantially higher than it is today; therefore, effect sizes may have been overestimated.

• In many studies focused on DBP, participants also had elevated SBP so it was not possible to determine whether the benefit observed in those trials arose from lowering DBP, SBP, or both.

• The review was not designed to determine whether therapy-associated adverse effects and harms resulted in significant changes in important health outcomes.
Important to note that this evidence-based guideline has not redefined high BP, and the panel believes that the 140/90 mm Hg definition from JNC 7 remains reasonable.

For all persons with hypertension, the potential benefits of a healthy diet, weight control, and regular exercise cannot be overemphasized. These lifestyle treatments have the potential to improve BP control and even reduce medication needs. Although the authors of this hypertension guideline did not conduct an evidence review of lifestyle treatments in patients taking and not taking antihypertensive medication, they support the recommendations of the 2013 Lifestyle Work Group.
• The recommendations from this evidence-based guideline from panel members appointed to the Eighth Joint National Committee (JNC 8) offer clinicians an analysis of what is known and not known about BP treatment thresholds, goals, and drug treatment strategies to achieve those goals based on evidence from RCTs.

• However, these recommendations are not a substitute for clinical judgment, and decisions about care must carefully consider and incorporate the clinical characteristics and circumstances of each individual patient.
Lifestyle Workgroup Recommendations

• Advise adults who may benefit from blood pressure lowering to:

• 1. Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar-sweetened beverages and red meats.

• Adapt this dietary pattern to appropriate calorie requirements, personal and cultural food preferences, and nutrition therapy for other medical conditions (including diabetes).

• Achieve this pattern by following plans such as the DASH dietary pattern, the USDA Food Pattern, or the American Heart Association Diet.
  Strength: A (strong)

• 2. Lower sodium intake.
  (Strong Recommendation – Grade A)

• 3. Consume no more than 2,400 mg of sodium per day and that a further reduction of sodium intake to 1,500 mg can result in even greater reduction in blood pressure. Even without achieving these goals, reducing sodium intake by at least 1,000 mg per day lowers blood pressure. (Moderate Recommendation – Grade B)

• 4. Combine the DASH dietary pattern with lower sodium intake. (Strong Recommendation – Grade A)
Lifestyle Physical Activity Recommendation

1. In general, advise adults to engage in aerobic physical activity to lower blood pressure: 3 to 4 sessions a week, lasting on average 40 minutes per session involving moderate-to-vigorous intensity physical activity.

(Moderate Recommendation – Grade B)
JNC 8 “Cliff Notes”

- Treat to 150/90 mm Hg in patients over age 60 and 140/90 for everybody else.
- Any of 4 classes of drugs could be chosen.
- Destination is important and not the journey.
- No stages please.
- In blacks C and D