**Recommendations**

1. In the general population ≥60yo, initiate pharmacologic treatment to lower BP at systolic BP of ≥150 or diastolic BP of ≥90 and treat to a goal SBP <140 and goal DBP <90.
   - a. Reduces stroke, heart failure, and coronary heart disease.
   - b. Setting a goal SBP of <140 in this age group provides no additional benefit compared with a higher goal SBP of 140-160 or 140-149.

2. In the general population <60yo, initiate pharmacologic treatment to lower BP at DBP ≥90 and treat to a goal DBP <90.
   - a. Reduces cerebrovascular events, heart failure, and overall mortality.
   - b. No benefit in treating pts to a goal of either ≤80 or ≤85 compared with ≤90 based on the HOT trial, in which pts were randomized to these 3 goals without statistically significant differences between treatment groups in the primary or secondary outcomes.
   - c. There is no good evidence in pts <30 that assessed benefits of treating ↑DBP on health outcomes, so the DBP threshold and goal is the same as in the 30-59yo group.

3. In the general population <60yo, initiate pharmacologic treatment to lower BP at ≥140 and treat to a goal SBP <140.

4. In the population with CKD, initiate pharmacologic treatment to lower BP at SBP ≥140 or DBP ≥90 and treat to goal SBP of <140 and goal DBP <90.
   - a. This recommendation applies to individual <70yo with an estimated GFR or measured GFR <60 and in people of any age with albuminuria (>30mg of albumin/g of creatinine) at any level of GFR.
   - b. In adults <70yo with CKD, the evidence is insufficient to determine if there is a benefit in mortality, or CV or cerebrovascular health outcomes with antihypertensive drug therapy to a lower BP goal (for example <130/80) compared with a goal of <140/90.

5. In the population 18yo or older with diabetes, initiate pharmacologic treatment to lower BP at SBP ≥140 or DBP of ≥90 and treat to a goal SBP <140 and goal DBP <90.
   - a. The only RCT that compared an SBP treatment goal of <140 with a lower SBP goal and assessed the effects on important health outcomes is ACCORD-BP, which compared an SBP treatment goal <120 with a goal lower than <140. There was no difference in the primary outcome, a composite of CV death, nonfatal MI, and nonfatal stroke. The panel concluded that that results from the ACCORD-BP did not provide sufficient evidence to recommend an SBP goal of <120 in adults with diabetes and HTN.
   - b. The panel recommends the same goal DBP in adults with diabetes and HTN in the general population (<90).

6. In the general nonblack population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic, Ca channel blocker, ACEI, or ARB.
   - a. 3 Federally funded trials were pivotal in demonstrating that treatment of HTN with antihypertensive medications reduces CV or cerebrovascular events and/or mortality.
   - b. The panel did not recommend β-blockers for the initial treatment of HTN because in one study, use of β-blockers resulted in a higher rate of the primary composite outcome of CV death, MI, or stroke compared to the use of an ARB, a finding that was driven largely by an increase in stroke.
   - c. α-Blockers were not recommended as 1st line therapy because in one study initial treatment with an α-blocker resulted in worse cerebrovascular, heart failure, and combined CV outcomes than initial treatment with a diuretic.
   - d. This recommendation applies to those with diabetes because trials including participants with diabetes showed no differences in major CV or cerebrovascular outcomes from those in the general population.

7. In the general black population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
   - a. Recommendation stems from a single large trial (ALLHAT) that showed a thiazide-type diuretic was more effective in improving cerebrovascular, heart failure, and combined CV outcomes compared to an ACEI in the black pt subgroup.
b. The panel recommended a CCB over an ACEI as 1st-line therapy in black pts because there was a 51% higher rate of stroke in black persons in ALLHAT with the use of an ACEI as initial therapy compared to use of a CCB.

8. In the population >18yo with CKD and HTN, initial (or add-on) antihypertensive treatment should include an ACEI or ARB to improve kidney outcomes. This applies to all CKD pts with HTN regardless of race or diabetes status.
   a. In black pts with CKD and proteinuria, an ACEI or ARB is recommended as initial therapy because of the higher likelihood of progression to ESRD. In black pts with CKD but without proteinuria, the choice of initial therapy is less clear and includes a thiazide-type diuretic, CCB, ACEI, or ARB.

9. The main objective of HTN 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 the thiazide-type diuretic, CCB, ACE, or ARB.
Overview of HTN in Adults

INTRODUCTION
- Most common reason for office visits, approximately 30% of the population has HTN, with 8% undiagnosed.
- 2005-2008 NHANES survey showed 50% pts with HTN have BP under control and the reasons are multifactorial; poor access to healthcare, medications, and lack of adherence of a condition that is usually asymptomatic.
- It is the most common risk factor for heart attack and stroke, and therefore considered a 'silent killer'.

DIAGNOSIS
- Screening (USPSTF)
  - Screen BP q2y for pts within the normal range <120/80, and q1y for prehypertensive pts (120-139/80-89).
- Measurement
  - In the absence of end-organ damage, mild HTN should be diagnosed by 2 BP measurements in both arms at 3 separate clinic visits at least 1w apart. (See Appendix)
  - In those who are believed to have white coat HTN, those appearing to not respond to prescribed antihypertensive medications, and confirm at-home BP measurements, ambulatory blood pressure monitoring may be indicated (measures BP q15-20m during the day and q30-60m during the night).

EVALUATION
- History
  - Duration of HTN: Last known BP, course of the BP
  - Prior Tx of HTN: Drugs (types, doses, side effects)
  - Ingested Agents That May Cause HTN: Oral contraceptives (estrogen), NSAIDs, antidepressants (TCAs, SSRIs), glucocorticoids, decongestants, weight loss medications, EPO, cyclosporine, stimulants, cocaine, methamphetamine, excessive sodium, alcohol, saturated fats
  - Family Hx: HTN, premature CV disease/death, familial disease (pheochromocytoma, renal disease, DM, gout)
  - Sx of Secondary Causes: Muscle weakness, spells of tachycardia, sweating tremor, thinning of the skin, flank pain, early morning HAs, daytime somnolence, loud snoring, erratic sleep
  - Sx of End-Organ Damage: CP, SOB, HAs, transient weakness/blindness, loss of visual activity, claudication
  - Other Risk Factors: Age, obesity, smoking, family history, race (African Americans), high sodium diet (>3000 mg/day), excessive alcohol consumption, physical inactivity, diabetes, dyslipidemia, hypovitaminosis D.
- Physical
  - Signs of end-organ damage, causes of secondary HTN, fundoscopic exam (hypertensive retinopathy).
  - General Appearance: Distribution of body fat, skin lesions, muscle strength, alertness
  - HEENT: Fundoscopy (hemorrhage, papilledema, cotton wool spots)
  - Neck: Palpation and auscultation of carotids, thyroid
  - Heart: Size, rhythm, sounds
  - Lungs: Rhonchi, rales
  - Abdomen: Renal masses, bruits over aorta or renal arteries, femoral pulses
  - Extremities: Peripheral pulses, edema
  - Neurologic Assessment: Visual disturbance, focal weakness, confusion
- Laboratory Tests
  - Newly Diagnosed HTN: Electrolytes, serum Cr (for eGFR), fasting glucose, UA, lipid profile, and EKG.
- Additional Tests
  - Only test for secondary causes if the pt has an unusual presentation (new onset at age extremes, presentation with stage 2 HTN, abrupt onset HTN, resistant HTN), those with a clinical clue for a specific cause of HTN.

Definitions (JNC7)
- Normal BP: <120/<80
- Prehypertension: Systolic 120-139 or Diastolic 80-89
- Hypertension:
  - Stage 1: Systolic 140-159 or Diastolic 90-99
  - Stage 2: Systolic ≥160 or Diastolic ≥100

Home BP Monitoring (2013 ESH/ESC)
- 24h Average: 130/80 or above
- Daytime Average: of 135/85 or above
- Nighttime Average: 120/70 or above
Overview of HTN in Adults

- **Hypertensive Urgency**: Severe HTN (diastole usually >120) in asymptomatic pts with NO target end-organ damage.
- **Hypertensive Emergency**: Severe HTN (diastole usually >120) in asymptomatic pts WITH target end-organ damage.
- **End-Organ Damage**: Not limited to coronary heart disease, hypertensive retinopathy, heart failure, stroke, CKD, acute hypertensive emergencies – hypertensive encephalopathy, acute aortic dissection.

**CAUSES**

- **White Coat HTN**: BP consistently elevated by office readings but does not meet criteria outside of the office (20% of Stage 1).
- **Masked HTN**: BP consistently elevated by outside-of-office measurements, but does not meet criteria in office.
- **Medications**: Oral contraceptives (estrogen), NSAIDs, antidepressants (TCAs, SSRIs), glucocorticoids, decongestants, weight loss medications, EPO, cyclosporine, stimulants
- **Illicit Drug Use**: Methamphetamines, cocaine
- **Risk Factors** (described above)
- **Disorders**: Primary renal disease (acute or chronic), renovascular disease (fibromuscular dysplasia in young, atherosclerosis in old), primary aldosteronism (suspect in any pt with HTN, unexplained hypokalemia, and metabolic alkalosis), obstructive sleep apnea, pheochromocytoma, Cushing’s syndrome (cortisol), coarctation of aorta.

**TREATMENT**

- **Lifestyle Modifications**
  - For all pts with HTN, lifestyle modifications should be implemented (see appendix).
    - Dietary salt restriction, weight loss, DASH diet (high in vegetables, fruits, low-fat dairy, whole grains, poultry, fish, nuts, low in sweets, sugar-sweetened beverages, and red meats), exercise (3-4x/w lasting 40 minutes), limited alcohol intake (women <2, men <3 drinks/d), pt education.
  - These modifications were shown in the PREMIER trial that at 18m, there was a lower prevalence of HTN (22 vs 32%).
- **Drug Treatment**
  - The main objective of HTN treatment is to attain and maintain goal BP.
  - Antihypertensive therapy produces a 50% relative risk reduction in the incidence of heart failure, 30-40% relative risk reduction in stroke, and a 20-25% relative risk reduction in MI.
  - **Recommendations for Initiating Treatment**
    - Systolic ≥140 (<60yo), or ≥150 (≥60) and/or diastolic ≥90 despite attempted nonpharmacologic therapy.
  - **Four Main Classes of Drugs Recommended for Use as Initial Monotherapy**
    - Thiazide diuretics, Long-acting Ca²⁺ channel blockers (most often dihydropyridine – amlodipine), ACE-I, ARBs
  - **Monotherapy**
    - In the general nonblack population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic, CCB, ACE-I, or ARB
    - In the general black population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
    - >18yo with CKD and HTN, initial (or add-on) antihypertensive treatment should include an ACE-I or ARB to improve kidney outcomes. This applies to all CKD pts with HTN regardless of race or diabetes status.
    - β-Blockers are no longer recommended as initial monotherapy in absence of a specific indication for their use (ischemic heart disease or HF with decreased EF.
  - **Combination Therapy** (See Appendix)
    - If goal BP is not reached within a month of treatment, increase the dose of the initial drug or add a second drug from the thiazide-type diuretic, CCB, ACE, or ARB. Combination therapy has a much greater effect than increasing dose of a single drug.
    - **Baseline BP 160/100**: 2 drugs may be started but should be used cautiously due to risk of orthostatic hypotension (diabetics, elderly).
    - Recommended therapy includes ACE-I/ARB + long acting dihydropyridine Ca²⁺ channel blocker.
  - **Follow Up**
    - After initiation, BP should be checked q2-4w and adjustments made until control is achieved.
    - Once control is achieved, evaluate q3-6m.
Overview of HTN in Adults

APPENDIX

Guidelines for the Measurement of BP to Diagnose and Treat HTN

PATIENT CONDITIONS

- **Posture**: Initially, check for postural changes by taking readings after 5m supine, then immediately and 2m after standing; this is particularly important in patients >65 years, diabetics, or those taking antihypertensive drugs. Sitting pressures are recommended for routine F/U; the patient should sit quietly with the back supported for 5m and the arm supported at the level of the heart.

- **Circumstances**: A quiet, warm setting, no caffeine during the hour preceding the reading, and no smoking during the preceding 30m, no exogenous adrenergic stimulants (phenylephrine in decongestants or eye drops for pupillary dilatation), home readings should be taken upon varying circumstances.

EQUIPMENT

- **Cuff Size**: The length of the bladder should be 80 percent, and the width of the bladder should be at least 40 percent of the circumference of the upper arm.

- **Manometer**: Aneroid gauges should be calibrated every six months against a mercury manometer.

TECHNIQUE

- **Number of Readings**: Take at least 2 readings on each visit, separated by as much time as possible; if readings vary by >5 mmHg, take additional reading until 2 consecutive readings are close, for the dx of hypertension, take 3 readings at least 1w apart. Initially, take blood pressure in both arms; if pressures differ, use the higher arm, if the arm pressure is elevated, take the pressure in one leg, particularly in patients <30 years old.

- **Performance**: Inflate the bladder quickly to 20 mmHg above the SBP as estimated from loss of radial pulse, deflate the bladder 3 mmHg/s, record the Korotkoff phase V (disappearance) as the DBP except in children in whom use of phase IV (muffling) may be preferable, if the Korotkoff sounds are weak, have the patient raise the arm, open and close the hand five to ten times, and then inflate the bladder quickly.

RECORDINGS

- Note the pressure pt position, arm, and cuff size.

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Appr. Systolic BP Reduction, Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Reduction</td>
<td>Maintain normal body weight (BMI, 18.5-24.9 kg/m²)</td>
<td>5-20mmHg per 10kg weight loss</td>
</tr>
<tr>
<td>DASH Diet</td>
<td>Diet rich in fruits, vegetables, low-fat dairy products, with a reduced content of saturated and total fat</td>
<td>8-14 mmHg</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Engage in regular aerobic physical activity such as brisk walking (at least 30m/d, most days of the week)</td>
<td>4-9 mmHg</td>
</tr>
<tr>
<td>Dietary Na Restriction</td>
<td>Decrease dietary Na intake to &lt;100 meq/day (2.4g Na or 6g NaCl)</td>
<td>2-8 mmHg</td>
</tr>
<tr>
<td>Moderation of EtOH Consumption</td>
<td>Limit consumption to ≤2 drinks/day in men and ≤1 drink/day in women and lighter-weight persons</td>
<td>2-4 mmHg</td>
</tr>
</tbody>
</table>
Overview of HTN in Adults

**AHA/ACC/CDC Algorithm**

**Systolic 140–159 or diastolic 90–99 (Stage 1 hypertension)**
- Lifestyle modifications as a trial
  - Consider adding thiazide

**Systolic >160 or diastolic >100 (Stage 2 hypertension)**
- Two drugs preferred:
  - Lifestyle modifications and
  - Thiazide and ACEI, ARB, or CCB
  - Or consider ACEI and CCB

**Overview of Hypertension in Adults**

**References**

1. UpToDate: Overview of Hypertension in Adults
2. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults (JNC 8)
3. AHA/ACC/CDC Science Advisory: An Effective Approach to High Blood Pressure Control
4. Kaiser Permanente Medical Care Program