

# Hypertension Guidelines Summary

## Prevention

- **Lifestyle modifications should be instituted in all patients at risk for hypertension**, including those with prehypertension.
- Dietary recommendations to lower BP consist of consuming a diet that emphasizes the intake of fruits, vegetables, and whole grains; includes poultry, fish, legumes, nuts, nontropical vegetable oils, and low-fat dairy products; and restricts the consumption of red meat, sweets, and sugar-sweetened beverages.
- Dietary sodium should be restricted to **<2400 mg/day (<1500 mg/day results in greater reductions) or by at least 1000 mg/day.**

## Screening

- Early detection of hypertension is essential in reducing the risk of **stroke, coronary artery disease, peripheral vascular disease, chronic kidney disease, and retinopathy.**
- In all patients starting at **18 years of age.** Screening should be done using sphygmomanometry using an appropriately sized cuff and proper technique.
- Normotensive and well patients, the optimal BP screening interval is unknown, although an interval of **every 2 years is reasonable.**

## Diagnosis

Classification	Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥160	≥100

- The diagnosis of hypertension is established by a **systolic BP ≥140 mm Hg and/or diastolic BP ≥90 mm Hg**
- **White coat hypertension:** elevated BP only in the office, Ambulatory BP monitoring should be performed
- **masked hypertension:** patients who are normotensive in the office may meet criteria for hypertension by ambulatory monitoring
  - associated with increased cardiovascular risk
- **Cardiovascular risk correlates directly with BP level and**, beginning at 115/75 mm Hg, doubles with each increment of 20/10 mm Hg.
- **All patients should be assessed for cardiovascular risk factors, including:**
  - Smoking, obesity, physical inactivity.
  - Dyslipidemia, diabetes mellitus (DM),
  - Moderately increased albuminuria (microalbuminuria) or estimated glomerular filtration rate <60 mL/min/1.73 m<sup>2</sup>,
  - Increased age, and family history of premature cardiovascular disease.

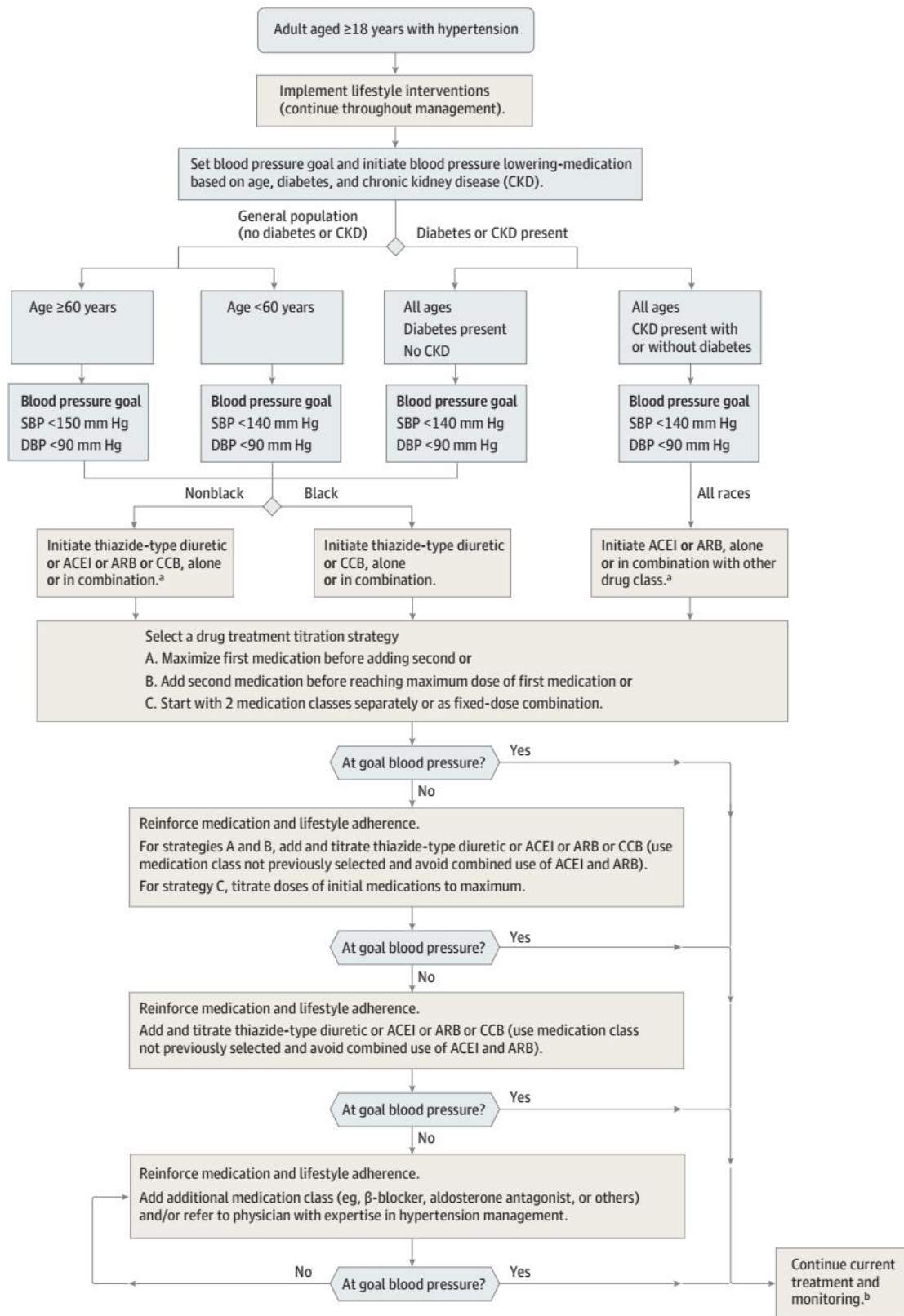
- The history can help determine the likelihood of **secondary hypertension** and to assess for **evidence of end-organ damage**, including **angina, heart failure, stroke, transient ischemic attack, kidney disease, or claudication**.
- Obtain the following studies in all patients: **(All of them are important)**
  - Hematocrit, glucose, creatinine, electrolytes, urinalysis, fasting lipid profile, and electrocardiography.
- **ECG** showing **left ventricular hypertrophy** and/or signs of previous infarction is evidence of cardiovascular damage.
  - Although echocardiography is more sensitive in diagnosing ventricular hypertrophy, **it is not routinely recommended in all patients with a new diagnosis of hypertension**.
- **Gestational hypertension**: blood pressure of  **$\geq 140/90$  mm Hg on two occasions at least 6 hours apart in a previously normotensive woman presenting at  $>20$  weeks' gestation**.
  - Hypertension arising at  $<20$  weeks' gestation is considered evidence of previously undiagnosed chronic hypertension.
  - **Urine protein-creatinine ratio** should be measured in all hypertensive pregnant women; query preeclampsia.
  - Elevated BP that persists beyond 12 weeks postpartum should be considered chronic hypertension.
  - Severe gestational hypertension (BP  $\geq 160/110$  mm Hg) and preeclampsia are associated with increased perinatal and maternal morbidity and mortality.

## Therapy

- **Therapeutic lifestyle changes** should be instituted in all patients with prehypertension and hypertension and should be continued even if drug therapy becomes necessary.
- **Any modifiable risk factors, such as obesity or smoking, should be treated.**
- **General adult population  $<60$  years of age:**
  - Pharmacologic treatment is recommended when the systolic BP is  **$\geq 140$  mm Hg or the diastolic BP is  $\geq 90$  mm Hg**.
  - The goal of therapy should be  **$<140/90$  mm Hg**.
- **In patients  $\geq 60$  years of age**
  - Therapy is recommended if the systolic BP is  **$\geq 150$  mm Hg or the diastolic BP is  $\geq 90$  mm Hg**.
  - The goal of treatment is  **$<150/90$  mm Hg**.
  - patients with a BP of  $<140/90$  mm Hg on well-tolerated therapy do not need to have their treatment changed.
- **Pts with DM or chronic kidney disease and  $>18$  years of age:**
  - initiation threshold and goal for pharmacologic treatment is  **$140/90$  mm Hg**
- **In the general non-African American population:**
  - May all be considered for initial treatment of hypertension, and all reduce the complications of hypertension:
    - ✓ **thiazide diuretics**
    - ✓ **angiotensin-converting enzyme inhibitors (ACEIs)**
    - ✓ **angiotensin receptor blockers (ARBs)**
    - ✓ **calcium channel blockers (CCBs)**

- **African Americans:**
  - initial therapy should be a **thiazide diuretic or CCB**
  - Diuretics may equalize the response of black patients to ACEIs and ARBs; in chronic kidney disease patients.
- **For all patients (regardless of race or the presence or absence of diabetes) >18 years of age with chronic kidney disease (including those with and those without proteinuria):**
  - Initial therapy should be an **ACEI or ARB** because these agents are renoprotective and improve renal outcomes.
  - In blacks with chronic kidney disease but without proteinuria:
    - ✓ the initial agent can be a CCB, thiazide diuretic, ACEI, or ARB. If the initial choice is not ACEI or ARB, then one of these should be the second drug added if necessary to lower the BP to target (<140/90 mm Hg).
- **Loop diuretics:**
  - Preferred for patients with chronic kidney disease and a **serum creatinine level >1.5 mg/dL (132.6 μmol/L) or a glomerular filtration rate <30-50 mL/min/1.73 m<sup>2</sup>.**
- **Without compelling indications, should not use as first-line therapy:**
  - **β-blockers:** particularly in older patients, due to the lack of data supporting an independent effect on morbidity and mortality.
  - **α-Blockers:** not as effective as diuretics and should not be used as monotherapy for hypertension.
  - **Direct renin inhibitors (eg, aliskiren):** relatively new agents that effectively lower BP but lack outcome data
  - Agents can effectively lower BP but lack data of improved cardiovascular outcomes and should not use as a first line therapy include:
    - ✓ **mineralocorticoid receptor antagonist diuretics (eg, spironolactone):**
    - ✓ **loop diuretics (eg, furosemide)**
    - ✓ **centrally acting α-2 agonists (eg, clonidine)**
    - ✓ **direct vasodilators (eg, hydralazine).**
- **Compelling indications for certain antihypertensive agents**
  - include coronary artery disease, heart failure, stroke, diabetes, and chronic kidney disease, particularly with proteinuria
  - In these instances, **the preferred agents are used first and continued** regardless of whether additional agents are needed to control BP.
    - ✓ **HTN + CAD = β-blockers;** they decrease cardiovascular mortality.
    - ✓ **HTN + asymptomatic ventricular dysfunction and symptomatic heart failure = ACE inhibitors;** decrease cardiovascular mortality.
    - ✓ **left ventricular hypertrophy = ARBs** may be specifically beneficial > β-blockers
    - ✓ **Combination ACEIs and thiazide diuretic therapy reduces recurrent stroke rates.**
    - ✓ **Chronic Kidney Disease and diabetic nephropathy = ACEIs and ARBs** reduce albuminuria and progression.
- **Two or three antihypertensive agents are often needed to reach target BP levels.**
  - single agent decreases **SBP by 12 to 15 mmHg and DBP by 8 to 10 mmHg**
  - *e.g. In patients with untreated stage 2 hypertension (>160/100 mm Hg), drug therapy may be initiated with a combination of antihypertensive medications.*
  - Combined therapy with an ACEI and ARB for treatment of hypertension is associated with increased adverse effects and no improvement in outcome and is **not recommended**

Figure. 2014 Hypertension Guideline Management Algorithm



SBP indicates systolic blood pressure; DBP, diastolic blood pressure; ACEI, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; and CCB, calcium channel blocker.

<sup>a</sup> ACEIs and ARBs should not be used in combination.

<sup>b</sup> If blood pressure fails to be maintained at goal, reenter the algorithm where appropriate based on the current individual therapeutic plan.

## Antihypertensive Drugs: Compelling Indications, Contraindications, and Side Effects

Drug Class	Compelling Indications	Contraindications	Side Effects
Diuretics	Heart failure, systolic hypertension	Gout, Thiazide in pregnant women	Hypokalemia, hyponatremia, hyperuricemia, glucose intolerance, hypercalcemia, hyperlipidemia, orthostatic hypotension, sexual dysfunction, insomnia; metabolic effects less common with low-dose therapy
$\beta$ -Blockers	Angina, heart failure, post-MI, tachyarrhythmia, migraine	Asthma, COPD, heart block	Bronchospasm, bradycardia, heart failure, impaired peripheral circulation, insomnia, fatigue, decreased exercise tolerance, hypertriglyceridemia, sexual dysfunction (uncommon), reduced awareness of hypoglycemia
ACE inhibitors	Heart failure, left ventricular dysfunction, post-MI, diabetic nephropathy, proteinuria	Pregnancy, bilateral renal artery stenosis, hyperkalemia	Azotemia, cough, angioedema, hyperkalemia, hypotension, rash, loss of taste, leukopenia
Angiotensin receptor blockers	ACE inhibitor cough, diabetic nephropathy, heart failure, post-MI but intolerant to ACE inhibitor	Pregnancy, bilateral renal artery stenosis, hyperkalemia	Azotemia, angioedema (rare), hyperkalemia, hypotension
Calcium channel blockers	Systolic hypertension, cyclosporine-induced hypertension, angina, coronary heart disease	Heart block and heart failure (verapamil, diltiazem, and short-acting dihydropyridines)	Edema, headache, dizziness, flushing, constipation
$\alpha$ -Blockers	Prostatic hypertrophy	Orthostatic hypotension	Headache, drowsiness, fatigue, weakness, postural hypotension

## Follow-Up

- **Uncontrolled hypertension** requires more vigilant follow-up, **at least monthly**, until control is achieved.
- **First:** A dose should be increased if partial response to a submaximal dose of the initial agent.
- **Second:** A second drug from a different class may be added if there is a partial response to an otherwise well-tolerated initial agent.
  - A thiazide diuretic may augment the effect of ACEIs and ARBs, particularly in African Americans
  - in patients at high risk for cardiovascular events, the preferred combination may be **ACEI plus a CCB**.
- **Third:** A third agent should be added if the target BP has not been reached.
  - If not used first or second, **a thiazide diuretic is the preferred third agent**.
  - $\beta$ -Blockers are reasonable to add as a fourth agent when maximal doses of more preferred drugs are insufficient.
- **Resistant hypertension is BP that is not at target level despite maximal doses of three antihypertensive agents, one being a diuretic.**
  - medication nonadherence
  - inadequate therapy
  - excessive alcohol consumption
  - other drugs (eg, NSAIDs, sympathomimetic agents).
- **Aldosterone antagonists (eg, spironolactone, eplerenone) are potentially effective additions for resistant hypertension, even in the absence of hyperaldosteronism.**
- **Evaluation for secondary hypertension is indicated only when the clinical situation is suggestive or a patient is adherent to a four-drug regimen without adequate control**
- Patients whose BP was previously well controlled and have an acute rise may also benefit from a secondary cause evaluation

Table 4. Evidence-Based Dosing for Antihypertensive Drugs

Antihypertensive Medication	Initial Daily Dose, mg	Target Dose in RCTs Reviewed, mg	No. of Doses per Day
<b>ACE inhibitors</b>			
Captopril	50	150-200	2
Enalapril	5	20	1-2
Lisinopril	10	40	1
<b>Angiotensin receptor blockers</b>			
Eprosartan	400	600-800	1-2
Candesartan	4	12-32	1
Losartan	50	100	1-2
Valsartan	40-80	160-320	1
Irbesartan	75	300	1
<b><math>\beta</math>-Blockers</b>			
Atenolol	25-50	100	1
Metoprolol	50	100-200	1-2
<b>Calcium channel blockers</b>			
Amlodipine	2.5	10	1
Diltiazem extended release	120-180	360	1
Nitrendipine	10	20	1-2
<b>Thiazide-type diuretics</b>			
Bendroflumethiazide	5	10	1
Chlorthalidone	12.5	12.5-25	1
Hydrochlorothiazide	12.5-25	25-100 <sup>a</sup>	1-2
Indapamide	1.25	1.25-2.5	1

## Causes of Secondary Hypertension

Cause	Notes
Drug-induced hypertension	Possible causes include NSAIDs, amphetamines, cocaine, sympathomimetic agents (eg, decongestants, dietary supplements), oral contraceptives, antidepressants, bromocriptine, erythropoietin, and glucocorticoids.
Chronic kidney disease	Late manifestations of kidney failure include elevated BUN, creatinine, potassium, and phosphate levels; low calcium level; and anemia. Most patients present at an earlier stage, with minimal signs and symptoms.
Renovascular disease (atherosclerotic and fibromuscular)	Characterized by onset of hypertension at a young age, especially in women (fibromuscular). Atherosclerotic disease is often associated with cigarette smoking, flash pulmonary edema, coronary artery disease, flank bruits, advanced retinopathy, elevated creatinine level (usually with bilateral renovascular disease), and an increase in creatinine level after treatment with an ACE inhibitor or ARB (ACE inhibitors or ARBs are preferred agents, if tolerated). Digital subtraction angiography is the diagnostic gold standard. Renal revascularization is indicated for most patients with fibromuscular dysplasia, but benefit is less clear with atherosclerotic stenosis.
Primary hyperaldosteronism	Characterized by muscle cramping, nocturia, thirst, hypokalemia, and hypernatremia. Physical examination is normal.
Pheochromocytoma	Characterized by sweating, heart racing, pounding headache, pallor, tachycardia, and elevated urine or plasma levels of catecholamines or metanephrine. Hypertension may be sustained or episodic, and orthostatic hypotension may also occur. Some patients with pheochromocytoma are normotensive.
Cushing syndrome	Characterized by weight gain, menstrual irregularity, hirsutism, truncal obesity, abdominal striae, hypokalemia, metabolic alkalosis, and elevated urine or blood cortisol levels.
Thyroid disease	Either hyper- or hypothyroidism may increase blood pressure. Hyperthyroidism is characterized by sweating, tachycardia, weight loss, tremor, and hyperreflexia. Hypothyroidism is characterized by cold intolerance, weight gain, goiter, and slowed reflexes.
Obstructive sleep apnea	Characterized by daytime sleepiness, snoring, nonrestorative sleep, gasping or choking at night, witnessed apnea, morning headaches, obesity, large neck circumference, and crowded oropharyngeal airway. Diagnosis is established with polysomnography. Treatment with positive airway pressure may decrease blood pressure modestly in some patients.
Aortic coarctation	Fairly common cause in children. Characterized by headache, cold feet, leg pain, reduced or absent femoral pulse, delay in femoral compared with radial pulse, murmur (continuous systolic and diastolic) heard between the scapulae, and three sign on chest radiography.

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