

## Adult Blood Pressure

### KEY POINTS

- BP is an important and modifiable risk factor for cardiovascular disease (CVD).
- In adults with elevated BP or hypertension, encourage a low sodium, high potassium, heart-healthy diet, physical activity, weight control, and limited alcohol use.
- To further promote vascular health, follow KP Guidelines to treat cholesterol and/or diabetes mellitus (DM), recommend aspirin use, and promote smoking cessation and adherence to medication and monitoring.
- Treat adults with hypertension to a goal BP < 140/90 mmHg.
- In adults with ASCVD, CKD, age ≥ 75 years, or 10-year ASCVD risk\*\* ≥ 10%, consider treating to a goal SBP of < 130 mmHg.
- In adults with ASCVD, CKD, age ≥ 75 years, or 10-year ASCVD risk\*\* ≥ 10%, consider treating to a goal SBP of < 130 mmHg.

*Exclude adults with estimated glomerular filtration rate (eGFR) < 20 mL/min/1.73<sup>2</sup> from this lower target.*

### DEFINITIONS

- KP National BP categories are defined in Table 1.

**Table 1: BP CATEGORIES**

BP Category	Systolic Blood Pressure (SBP) mmHg	Diastolic Blood Pressure (DBP) mmHg
Normal	< 120 and	< 80
Elevated or Prehypertension*	120 – 139* or	80 – 89
Hypertension*	≥ 140* or	≥ 90

*(Updated February 2019)*

- \*Hypertension may also be diagnosed in adults with SBP 130-139, when starting or taking a blood pressure medicine, and with at least one of the following: ASCVD, CKD, age ≥ 75 years, or 10-year ASCVD risk\*\* ≥ 10%.
- BP values in this table and elsewhere in this document refer to standard office BP measurements unless otherwise specified. See Table 2 for corresponding SBP/DBP values.
- **ASCVD**, atherosclerotic cardiovascular disease. **CKD**, chronic kidney disease.
- **10-year ASCVD risk\*\*** is the risk of fatal or nonfatal myocardial infarctions or strokes in adults.

*\*\*A region may choose which tool (and corresponding cut-point) to use for calculating 10-year ASCVD risk based on regional needs. [Kaiser Permanente ASCVD Risk Estimator \(KPARE\)](#) of 10% correlates approximately with ACC/AHA ASCVD Risk of 15% and Framingham Risk Score of 15% (used in SPRINT) at the population level.*

### SCREENING

#### Screening and Diagnosis of High Blood Pressure

- Screen adults aged ≥ 18 years for high BP.
  - In adults aged 18-39 years with BP < 130/85 mmHg without other risk factors, screen every 3 to 5 years.
  - In adults aged ≥ 40 years and those at increased risk of high BP, screen annually. Adults at increased risk include those who have BP ≥ 130/85 mmHg or are overweight, obese, or Black/African American.

- Obtain measurements outside of the clinical setting for diagnostic confirmation before starting treatment.
- BP readings equal to or higher than those in Table 2, Row 1 confirms the diagnosis of hypertension. Use clinical judgment or regional protocol if obtaining BP outside the clinical setting is not possible. Automated office blood pressure (AOBP) measurements at  $\geq 2$  visits may be used.
- Diagnose hypertension for BP  $\geq 180/110$  at a single office reading or  $\geq 150/100$  with clinical evidence of target organ damage (left ventricular hypertrophy, hypertensive retinopathy, or hypertensive nephropathy).

**Table 2: CORRESPONDING SBP/DBP VALUES**

Office BP	AOBP	Home BPM	Day ABPM	Night ABPM	24-Hour ABPM
140/90	135/85	135/85	135/85	120/70	130/80
130/90	130/85	130/85	130/85	110/70	125/80

**Office BP:** Taken in the clinic setting using an oscillometric (preferred) or aneroid device but not including automated office BP.

**AOBP:** Taken in the clinic setting using a commercially available device that allows for measurements to be taken with patient unobserved.

**Home BP Monitoring (Home BPM):** Taken by the patient at home (see Box 1).

**Ambulatory BP Monitoring (ABPM):** Taken at regular intervals by a device worn by the patient, usually for 24 hours.

**FIGURE 1: OPTIMAL HOME BP MEASUREMENT**

- The patient should measure 2 sets of 2-3 readings each day: one set in the AM and one set in the PM.
- AM and PM sets from at least three days over the course of one week should be collected.
- The first set should start after 5 minutes of rest with additional readings at 1-minute intervals.
- Average the lowest readings from each day's AM and PM set.
- Encourage patients to validate their device with an office device annually.
- Member education resources may be available for your region in HealthConnect, in the [Clinical Library](#), or see the [SCAL](#) or [NCAL](#) versions.

## TREATMENT INITIATION, BLOOD PRESSURE TARGETS, AND TYPICAL TESTS

### ALL ADULTS

- In adults with confirmed hypertension, initiate pharmacologic treatment to lower BP at SBP  $\geq 140$  mmHg or DBP  $\geq 90$  mmHg and treat to a goal SBP  $< 140$  mmHg and goal DBP  $< 90$  mmHg (Table 2, Row 1).

### SBP $< 130$ MMHG

- In adults with ASCVD, CKD, age  $\geq 75$  years, or 10-year ASCVD risk\*\*  $\geq 10\%$ , consider pharmacologic treatment at SBP  $\geq 130$  mmHg and treat to a goal SBP of  $< 130$  mmHg (Table 2, Row 2). Incorporate BP monitoring details, medication benefits and risks, and patient preferences when deciding whether to treat to this lower target.

*Exclude adults with eGFR  $< 20$  mL/min/1.73<sup>2</sup> from this lower target.*

*\*\*A region may choose which tool (and corresponding cut-point) to use for calculating 10-year ASCVD risk based on regional needs. [KPARE](#) of 10% correlates approximately with [ACC/AHA ASCVD Risk](#) of 15% and Framingham Risk Score of 15% (used in [SPRINT](#)) at the population level.*

### DM

- DM alone does not qualify for goal SBP  $< 130$  mmHg. DM is a variable in [KPARE](#).

### ELDERLY OR FRAIL ADULTS

- Because elderly or frail adults are at higher risk for postural hypotension, check standing BP to guide treatment decisions.
- Incorporate BP monitoring details, medication benefits and risks, and patient preferences in elderly or frail adults.

## DOWN-TITRATION

- Consider down-titration of BP medication in adults with SBP < 110 mmHg without other indications for medication, such as heart failure, or with symptoms of orthostasis.

## TYPICAL TESTS

- Typical tests for adults with a new diagnosis of hypertension may include: fasting glucose or hemoglobin A1C, lipid panel, creatinine with eGFR, sodium, potassium, calcium, thyroid stimulating hormone, complete blood count, urinalysis, and electrocardiogram.

## PHARMACOTHERAPY AND MONITORING

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### ATTAIN AND MAINTAIN GOAL BP

- The main objective of BP treatment is to attain and maintain goal BP. If goal BP is not reached within a month of treatment, consider increasing the dose of the initial drug or add a second drug from one of the thiazide-type diuretic, angiotensin-converting enzyme inhibitor (ACEI), angiotensin receptor blocker (ARB), or calcium channel blocker (CCB) classes. The clinician should consider continued assessment of BP and adjustment of the treatment regimen until goal BP is reached. If goal BP cannot be reached with 2 drugs, consider adding and titrating a third drug from the indicated classes. If goal BP cannot be reached using only the drugs in these classes because of contraindications or the need for > 3 drugs to reach goal BP, antihypertensive drugs from other classes can be considered. Consider referral to a hypertension specialist 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.

### DRUG-DRUG INTERACTION

- Simultaneous use of an ACEI, ARB, and/or renin inhibitor is potentially harmful and is not recommended.

### INITIAL THERAPY

- Initial single pill combination therapy with lisinopril-hydrochlorothiazide is preferred. This may be used as initial therapy in all adults.

### CKD

- In adults with CKD, regardless of race, consider initial (or add-on) treatment that includes an ACEI or ARB to improve kidney outcomes.

### BLACK/AFRICAN AMERICAN

- In Black/African American adults without heart failure or CKD, initial treatment should include a thiazide diuretic or CCB.

### CAD, HF, DM

- KP Guideline recommendations for coronary artery disease, heart failure, and DM may inform medication use independent of BP in certain individuals.

### THREE MEDICATIONS

- If BP is not controlled within a month of treatment on a thiazide-type diuretic plus ACEI, then add a CCB.

### FOUR MEDICATIONS

- If BP is not controlled within a month of treatment on a thiazide-type diuretic plus ACEI plus CCB, then add spironolactone (if on thiazide AND eGFR  $\geq$  60mL/min/1.73 m<sup>2</sup> AND potassium < 4.5 mEq/L). If criteria for use of spironolactone are not met, use beta blocker as fourth agent.

### WOMEN OF CHILDBEARING POTENTIAL

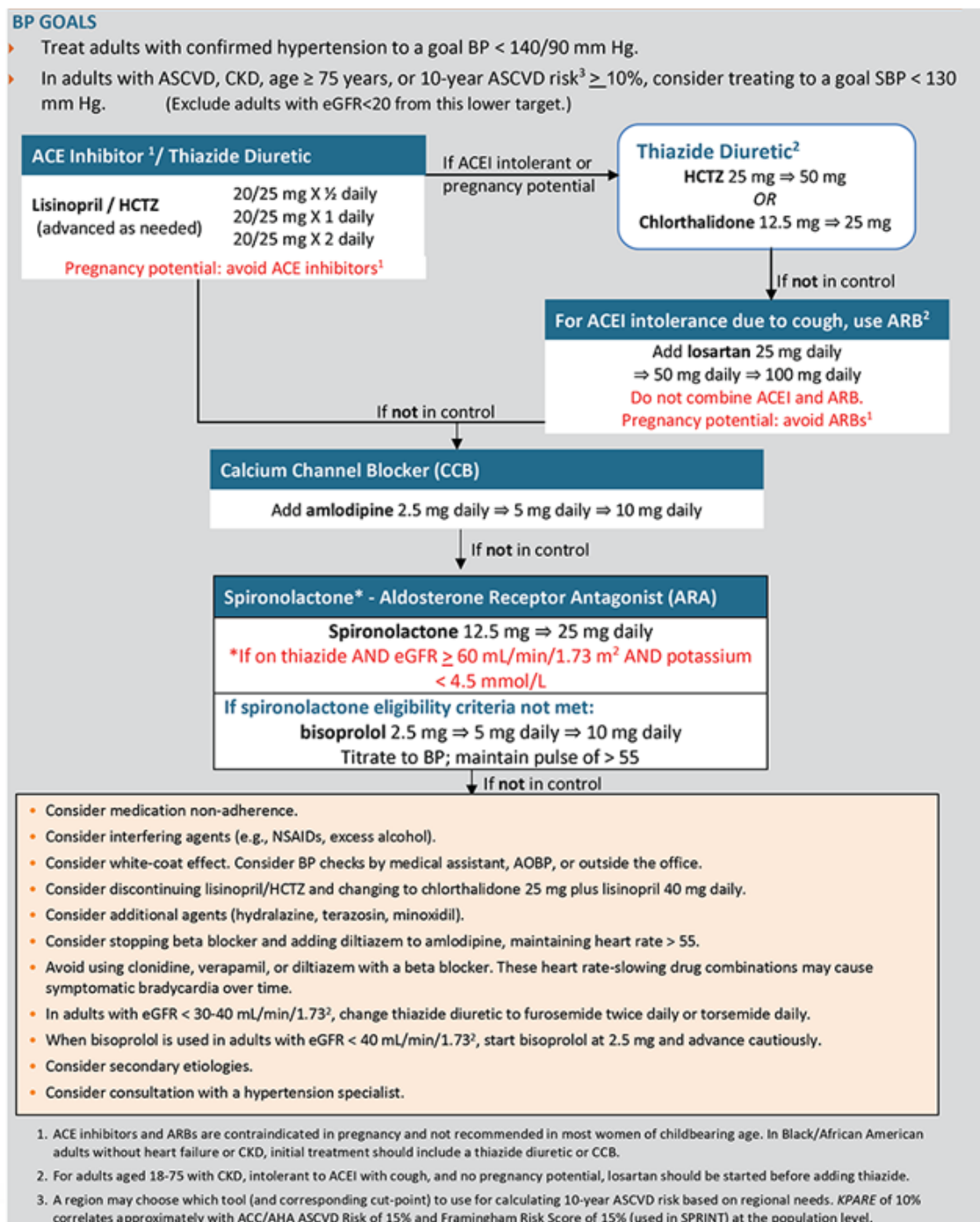
- Half of all pregnancies are unplanned. Do not prescribe medications contraindicated in pregnancy, such as ACEIs/ARBs, to women of childbearing potential, unless there is a compelling indication. For women of childbearing potential taking medications contraindicated in pregnancy, such as ACEIs/ARBs:

- Discuss potential risks to the fetus if they become pregnant. Discuss practicing contraceptive measures with extremely low failure rates (sterilization, implant, or IUD).
- Advise women using ACEIs/ARBs to stop these medications and advise all women with hypertension to contact their OB/GYN provider immediately if they become pregnant.

## MONITORING

- In adults with controlled hypertension, monitor BP at least annually.
- Self-monitoring of BP and team-based care can help achieve BP control.

**FIGURE 2: MANAGEMENT OF ADULT BLOOD PRESSURE (BP)**



## LIFESTYLE, OTHER RISK FACTORS, AND ADHERENCE

### LIFESTYLE

- In adults with BP ≥ 120/80 mmHg:

- A low sodium, high potassium, heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet is recommended.
- Increased physical activity with a structured exercise program is recommended.
- Weight loss in adults who are overweight or obese is recommended.
- Men and women who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks\* per day, respectively.

\*In the United States, 1 standard drink contains approximately 14 g of pure alcohol, typically found in 12 oz of regular beer (approximately 5% alcohol), 5 oz of wine (approximately 12% alcohol), and 1.5 oz of distilled spirits (approximately 40% alcohol).

## OTHER RISK FACTORS

- To further promote vascular health, follow KP Guidelines to treat cholesterol and diabetes mellitus, recommend aspirin use, and promote tobacco cessation.

## ADHERENCE

- Encourage adherence to medications and monitoring. Help overcome barriers.
  - Once-daily and combination pills can help minimize pill burden (number of daily pills needed), number of medication copays, and inconvenience.
  - Explore and help overcome barriers to medication adherence and monitoring. Collaborate with patients, families, caregivers, and the care team to problem solve and implement solutions.
  - Address depression and anxiety issues to maximize patient adherence. See [KP National Depression Guideline](#).
  - Educate patients about their goal BP because patients who are knowledgeable about their goal BP are more likely to achieve it.

**TABLE 3. SELECTED BLOOD PRESSURE MEDICATIONS\***

Selected Antihypertensive Medication		Usual Dose Range, comments
Single Pill Combinations	<b>Lisinopril/HCTZ (Prinzide)</b>	10/12.5 mg - 20/25 mg. May use 20/25 mg at ½, 1, then 2 tabs daily. <b>Preferred initial therapy.</b>
	Amlodipine/Benazepril (Lotrel)	2.5/10 mg – 10/40 mg daily.
	Losartan/HCTZ (Hyzaar)	50/12.5 mg – 100/25 mg daily. Cannot maximize diuretic with this combination.
	Bisoprolol/HCTZ (Ziac)	2.5/6.25 mg – 10/6.25 mg daily. Cannot maximize diuretic with this combination.
Thiazide-type Diuretics	Hydrochlorothiazide (HCTZ) (Esidrix)	12.5 – 50 mg daily, half-life 6-15 hrs.
	Chlorthalidone (Hygroton)	12.5 – 25 mg daily, half-life 45-60 hrs.
	Indapamide (Lozol)	1.25 – 2.5 mg daily, half-life 14-25 hrs.
ACE Inhibitors (ACEI)	Lisinopril (Zestril, Prinivil)	10 – 40 mg daily.
	Benazepril (Lotensin)	5 – 40 mg daily.
Angiotensin II Receptor Blockers (ARB)	Losartan (Cozaar)	25 – 100 mg daily. <b>Do not use with ACEI.</b>
Long-Acting Dihydropyridine Calcium Channel Blockers (CCB)	Amlodipine (Norvasc)	2.5 – 10 mg daily.
	Felodipine ER (Plendil)	2.5 – 10 mg daily.
Aldosterone Receptor Antagonist (ARA)	Spironolactone (Aldactone)	12.5 – 25 mg daily.
Beta-Blockers (BB)	Bisoprolol (Zebeta)	2.5 – 10 mg daily, half-life 9-12 hrs. Preferred in HFrEF

**TABLE 3. SELECTED BLOOD PRESSURE MEDICATIONS\***

Selected Antihypertensive Medication		Usual Dose Range, comments
	Atenolol (Tenormin)	25 – 100 mg total, daily or BID, half-life 6-7 hrs. Do not use in heart failure, adjust dose in CKD. Not recommended in HFrEF. Adjust dose in CKD.
	Carvedilol (Coreg)	3.125 – 37.5 mg BID. Appropriate for use in heart failure. Preferred in HFrEF**.
	Metoprolol (Lopressor)	25 – 100 mg BID. Do not use in heart failure. Not recommended in HFrEF.
	Metoprolol succinate (Toprol XL)	25 – 200 mg daily. Time-to-peak 10 hrs, half-life 3-7 hrs. Preferred in HFrEF.

Abbreviations: BID, twice daily; HFrEF, heart failure with reduced ejection fraction; hrs, hours. (Updated February 2019)

\*Some details may vary depending on regional contracts and formularies. Spironolactone/HCTZ (Aldactazide) removed from table due to high cost. For adults taking a diuretic, ACEI, ARB, or aldosterone receptor antagonist (ARA), monitor potassium and creatinine annually. For adults taking diuretics, consider monitoring sodium annually.

\*\*For HF patients > 85 kg, max dose is up to 50 BID.

**Table 4: Terminology**

Recommendation Language	Strength*	Action
Start, initiate, prescribe, treat, etc.	Strong affirmative	Provide the intervention. Most individuals should receive the intervention; only a small proportion will not want the intervention.
Consider starting, etc.	Conditional affirmative	Assist each patient in making a management decision consistent with personal values and preferences. The majority of individuals in this situation will want the intervention, but many will not. Different choices will be appropriate for different patients.
No recommendation for or against	None	Given that the balance between desirable and undesirable effects, the evidence quality, the values and preferences, and the resource allocation implications of an intervention do not drive a recommendation in one particular direction, recommendations will be made at the discretion of the individual clinician.
Consider stopping, etc.	Conditional negative	Assist each patient in making a management decision consistent with personal values and preferences. The majority of individuals in this situation will not want the intervention, but many will. Different choices will be appropriate for different patients.
Stop, do not start, etc.	Strong negative	Do not provide the intervention. Most individuals should not receive the intervention; only a small proportion will want the intervention.

\*Refers to the extent to which one can be confident that the desirable effects of an intervention outweigh its undesirable effects.

## ABOUT THIS RESOURCE

This Clinician Guide is based on the 2019 KP National Blood Pressure (BP) Guideline. It was developed to assist primary care physicians and other health care professionals in the outpatient setting with screening and treatment of elevated BP in non-pregnant adults aged ≥ 18 years. The KP National BP Guideline was revised after review of the 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. It is not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by practitioners.

- **Last Review:** February 2019
- **Next Review:** February 2021
- [Guideline Documentation](#)
- [Summary of Recent Changes \(2018-2019\)](#)
- [UpToDate and KP National Guidelines](#)
- [KP National Guideline Program Methodology](#)

- Work in progress on this guideline is updated regularly on the related Evidence Services [Wiki Page](#) for this topic

## DISCLAIMER

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This guideline is informational only. It is not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by practitioners, considering each patient's needs on an individual basis. Guideline recommendations apply to populations of patients. Clinical judgment is necessary to design treatment plans for individual patients.

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