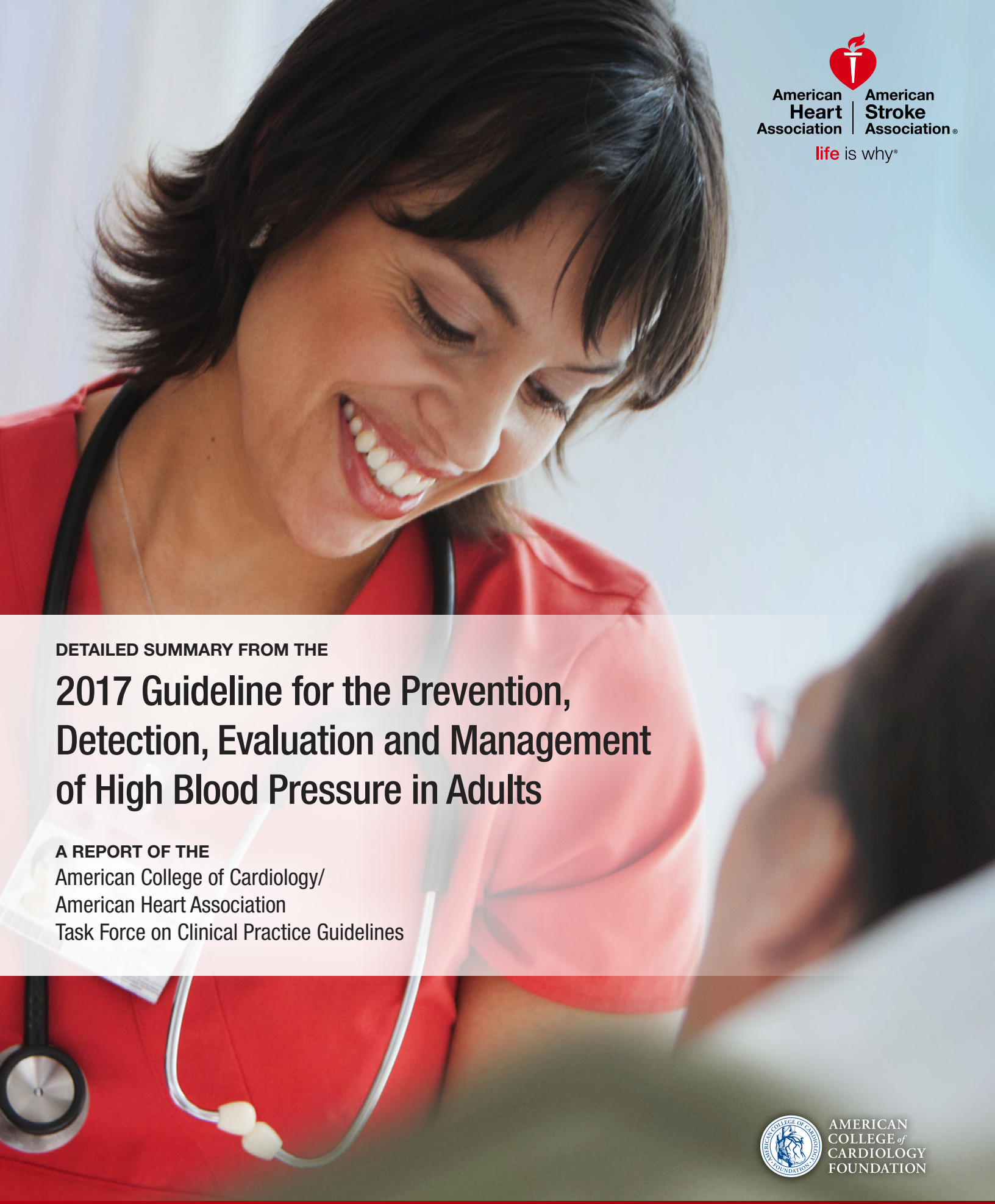

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DETAILED SUMMARY FROM THE

2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults

A REPORT OF THE
American College of Cardiology/
American Heart Association
Task Force on Clinical Practice Guidelines

AMERICAN COLLEGE of CARDIOLOGY FOUNDATION

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Detailed Summary

From the 2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults

Acknowledgments

American Academy of Physician Assistants, Association of Black Cardiologists, American College of Preventive Medicine, American Geriatrics Society, American Pharmacists Association, American Society of Hypertension, American Society for Preventive Cardiology, National Medical Association, Preventive Cardiovascular Nurses Association

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What's New?

The 2017 Hypertension Guideline features a few key changes[1]

New blood pressure targets and treatment recommendations: For years, hypertension was classified as a blood pressure (BP) reading of 140/90 mm Hg or higher, but the updated guideline classifies hypertension as a BP reading of 130/80 mm Hg or higher. The updated guideline also provides new treatment recommendations, which include lifestyle changes as well as BP-lowering medications, as shown in Table 1.

TABLE 1. Classification of BP

BP Category	Systolic BP		Diastolic BP	Treatment or Follow-up
Normal	<120 mm Hg	**and**	<80 mm Hg	Evaluate yearly; encourage healthy lifestyle changes to maintain normal BP
Elevated	120-129 mm Hg	**and**	<80 mm Hg	Recommend healthy lifestyle changes and reassess in 3-6 months
Hypertension: stage 1	130-139 mm Hg	**or**	80-89 mm Hg	Assess the 10-year risk for heart disease and stroke using the atherosclerotic cardiovascular disease (ASCVD) risk calculator • If risk is less than 10%, start with healthy lifestyle recommendations and reassess in 3-6 months • If risk is greater than 10% or the patient has known clinical cardiovascular disease (CVD), diabetes mellitus, or chronic kidney disease, recommend lifestyle changes and BP-lowering medication (1 medication); reassess in 1 month for effectiveness of medication therapy – If goal is met after 1 month, reassess in 3-6 months – If goal is not met after 1 month, consider different medication or titration – Continue monthly follow-up until control is achieved
Hypertension: stage 2	≥140 mm Hg	**or**	≥90 mm Hg	Recommend healthy lifestyle changes and BP-lowering medication (2 medications of different classes); reassess in 1 month for effectiveness • If goal is met after 1 month, reassess in 3-6 months • If goal is not met after 1 month, consider different medications or titration • Continue monthly follow-up until control is achieved

TABLE 2. Hypertensive Crises: Emergencies and Urgencies (See Section 11.2 of 2017 Hypertension Guideline)

Hypertensive Crises	Systolic BP		Diastolic BP	Treatment or Follow-up
Hypertensive urgency	>180 mm Hg	**and/ or**	>120 mm Hg	Many of these patients are noncompliant with antihypertensive therapy and do not have clinical or laboratory evidence of new or worsening target organ damage; reinstitute or intensify antihypertensive drug therapy, and treat anxiety as applicable
Hypertensive emergency	>180 mm Hg + target organ damage	**and/ or**	>120 mm Hg + target organ damage	Admit patient to an intensive care unit for continuous monitoring of BP and parenteral administration of an appropriate agent in those with new/ progressive or worsening target organ damage (see Tables 19 and 20 in the 2017 Hypertension Guideline)

Pharmacologic recommendations: The updated guideline recommends BP-lowering medication for those with stage 1 hypertension with clinical CVD or a 10-year risk of ASCVD 10% or greater, as well as for those with stage 2 hypertension. For stage 2, the recommendation is 2 BP-lowering medications in addition to healthy lifestyle changes, which is a more aggressive treatment standard—previous guidelines recommended starting patients on only 1 BP-lowering medication.

The guideline also updates the recommendations for specific populations. Because black adults are more likely to have hypertension than other groups, 2 or more antihypertensive medications are recommended to achieve a target of less than 130/80 mm Hg in this group, and thiazide-type diuretics and/or calcium channel blockers are more effective in lowering BP alone or in multidrug regimens. Morbidity and mortality attributed to hypertension are more common in black and Hispanic adults compared with white adults.

For adults starting a new or adjusted drug regimen to treat hypertension, follow up with them each month to determine how well they are following and responding to their prescribed treatment until their BP is under control.[2-4] For a full list of medications, see Table 5 in these highlights.

Emphasis on cardiovascular disease: The updated guideline provides recommendations for patients with clinical CVD and makes new recommendations for using the ASCVD risk calculator:

- Use BP-lowering medication for **primary** prevention of CVD in adults with no history of CVD ***and*** an estimated 10-year ASCVD risk less than 10% ***and*** a systolic BP of 140 mm Hg or greater ***or*** a diastolic BP of 90 mm Hg or greater.[5-9]
- Use BP-lowering medications for **secondary** prevention of recurrent CVD events in patients with clinical CVD ***and*** an average systolic BP of 130 mm Hg or greater ***or*** a diastolic BP of 80 mm Hg or greater ***and*** for **primary** prevention in adults with an estimated 10-year risk of ASCVD of 10% or greater with an average systolic BP of 130 mm Hg or greater ***or*** average diastolic BP of 80 mm Hg or greater.[5,10-17]

No prehypertension: The updated guideline eliminates the term *prehypertension* and instead uses the term *elevated BP* for a systolic BP of 120 to 129 mm Hg and a diastolic BP of less than 80 mm Hg.

More hypertension patients: Because the new definition of hypertension is lower (130/80 mm Hg), more people will be classified as having hypertension. However, most of these new patients can prevent hypertension-related health problems through lifestyle changes alone.

The new Hypertension Guideline changes the definition of hypertension, which is now considered to be any systolic BP measurement of 130 mm Hg or higher—or any diastolic BP measurement of 80 mm Hg or higher.

Hypertensive urgency vs hypertensive emergency: Hypertensive urgencies are associated with severe BP elevation in otherwise stable patients without acute or impending change in target organ damage or dysfunction. Hypertensive emergencies are severe elevations in BP associated with evidence of new or worsening target organ damage.

Focus on accurate measurements: To ensure accurate measurements, make sure the instrument you are using is properly calibrated. The updated guideline also stresses the basic processes for accurately measuring BP, including some simple yet critical actions before and during measurements. For accurate in-office measurements, do the following:

- Have the patient avoid smoking, caffeine, or exercise within 30 minutes before measurements; empty his or her bladder; sit quietly for at least 5 minutes before measurements; and remain still during measurements.
- Support the limb used to measure BP, ensuring that the BP cuff is at heart level and using the correct cuff size; don't take the measurement over clothes.
- Measure in both arms and use the higher reading; an average of 2 to 3 measurements taken on 2 to 3 separate occasions will minimize error and provide a more accurate estimate.

For more information about accurate measurements, see Tables 8 and 9 in the 2017 Hypertension Guideline.

Focus on self-monitoring: Office BPs are often higher than ambulatory or home BPs, so the updated guideline emphasizes having patients monitor their own BP for hypertension diagnosis, treatment, and management. Patients should follow these steps:

- Use the same validated instrument at the same time when measuring at home to more accurately compare results.
- Position themselves correctly, with the bottom of the cuff directly above the bend of the elbow.
- Optimally, take at least 2 readings 1 minute apart each morning before medication and each evening before supper. Ideally, obtain weekly readings 2 weeks after a treatment change and the week before a clinic visit.
- Record all readings accurately; use a monitor with built-in memory and bring it to all clinic appointments.

For clinical decision-making, base the patient's BP on an average from readings on 2 or more occasions.

Treatment recommendations: The updated guideline presents new treatment recommendations, which include lifestyle changes as well as BP-lowering medications. These lifestyle changes can reduce systolic BP by approximately 4 to 11 mm Hg for patients with hypertension, with the biggest impacts being changes to diet and exercise.

- In addition to promoting the DASH diet, which is rich in fruits, vegetables, whole grains, and low-fat dairy products, the updated guideline recommends reducing sodium intake and increasing potassium intake to reduce BP. However, some patients may be harmed by excess potassium, such as those with kidney disease or who take certain medicines. See Table 15 in the 2017 Hypertension Guideline for more information.
- Each patient's ideal body weight is the best goal, but as a rule, expect about a 1 mm Hg BP reduction for every 1 kg reduction in body weight.
- Recommendations for physical activity include 90 to 150 minutes of aerobic and/or dynamic resistance exercise per week and/or 3 sessions per week of isometric resistance exercises.
- For patients who drink alcohol, aim for reducing their intake to 2 or fewer drinks daily for men and no more than 1 drink daily for women.

New targets for comorbidities: For patients with comorbidities, the updated guideline generally recommends prescribing BP-lowering medications in patients with clinical CVD and new stage 1 or stage 2 hypertension to target a BP of less than 130/80 mm Hg (this was previously less than 140/90 mm Hg). The guideline recommends different follow-up intervals based on the stage of hypertension, type of medication, level of BP control, and presence of target organ damage.

Introduction

This Hypertension Highlights publication summarizes key changes and information from the *2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults*. It focuses on recommendations and changes that are most significant for the treatment of patients with hypertension. For more detailed information and references, see the full 2017 Hypertension Guideline publication.

Important Statistics

The 2017 Hypertension Guideline includes some important new statistics. Under the updated guideline, more people will be diagnosed with hypertension—nearly half of American adults (46%), up from 32% under the previous definition. But nearly all of these new patients can treat their hypertension with lifestyle changes instead of medications, and overall only a small percentage more adults will also require antihypertensive medications.

Specifically, the updated guideline means that most black adults have hypertension—56% of women and 59% of men—and black men now have the highest rate of hypertension; previously, black women did. Hypertension rates will also nearly triple among all men 20 to 44 years of age, increasing to 30% from 11%. In addition, rates of hypertension will double among women younger than age 45, from 10% to 19%. Hypertension is also present in more than 80% of patients with atrial fibrillation, by far the most common comorbid condition regardless of age,[18] and 80% of adults with diabetes mellitus have hypertension.[19]

Other statistics in the updated guideline show that only about 20% of patients with hypertension followed their treatment plan well enough to improve, and up to 25% of patients fail to even fill their initial prescription. Left untreated, systolic BP higher than 180 mm Hg or diastolic BP higher than 120 mm Hg can lead to a nearly 80% chance of the patient dying within a year. Average survival for this group is about 10 months.

Diagnosing Hypertension

RECOMMENDATION: *BP CATEGORIES ARE NORMAL, ELEVATED, OR STAGE 1 OR 2 HYPERTENSION.*[1]

The new Hypertension Guideline changes the definition of hypertension, which is now considered to be any systolic BP measurement of 130 mm Hg or higher *or* any diastolic BP measurement of 80 mm Hg or higher. *Hypertension* was previously defined as a systolic BP of 140 mm Hg or higher or a diastolic BP of 90 mm Hg or higher. With the updated guideline, measurements of 140/90 mm Hg or higher are considered *stage 2 hypertension*. Individuals with stage 1 or stage 2 hypertension should consult a healthcare provider for further treatment. Extremely high BP (systolic higher than 180 mm Hg or diastolic higher than 120 mm Hg) with target organ damage is still considered an emergency.

A continuous association exists between higher BP and increased CVD risk, so it is useful to categorize BP levels for clinical and public health decision-making: normal BP, elevated BP, stage 1 hypertension, and stage 2 hypertension.

Measurement of BP

Although measuring BP in office settings is relatively easy, errors commonly occur, which can obscure a patient's true BP level. Growing evidence supports the use of automated office BP measurements.[20]

The updated guideline focuses on reinforcing the key steps to properly measure BP in the office, as outlined in Table 3.

Patient Evaluation and History

When evaluating patients, note that *primary hypertension* likely requires treatment and is not due to a modifiable factor while *secondary hypertension* causes need to be explored and corrected before you diagnose hypertension.

Certain historical features favor specific causes of hypertension. Features of primary hypertension include

- Gradual increase with slow rate of rise in BP
- Lifestyle factors that favor higher BP
- Family history of hypertension

Features of secondary hypertension include

- BP lability, episodic pallor, and dizziness (pheochromocytoma)
- Snoring, hypersomnolence (obstructive sleep apnea)
- Prostatism (chronic kidney disease)
- Muscle cramps, weakness (hypokalemia from primary or secondary aldosteronism)
- Weight loss, palpitations, heat intolerance (hyperthyroidism)
- Edema, fatigue, frequent urination (kidney disease or failure)
- History of coarctation repair
- Central obesity, facial rounding, easy bruisability (Cushing syndrome)
- Medication or substance use (eg, alcohol, nonsteroidal anti-inflammatory drugs, cocaine)
- Absence of family history of hypertension

TABLE 3. Key Steps to Measure BP in Office

Step	Key Instructions
1. Prepare the patient	• Have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min. • Make sure the patient avoids caffeine, exercise, and smoking for at least 30 min before the measurement.
2. Use the proper technique for BP measurements	• Support the patient's arm (eg, resting on a desk). • Using the correct cuff size, position the middle of the cuff on the patient's upper arm at the midpoint of the sternum.
3. Take measurements needed for diagnosis and treatment	• At the first visit, record BP in both arms, and use the arm with the higher reading. • Use a palpated estimate of radial pulse obliteration pressure for systolic BP and inflate the cuff 20-30 mm Hg above this level to determine the BP level. • Deflate the cuff pressure 2 mm Hg per second and listen for Korotkoff sounds.
4. Document accurate BP readings	• Record systolic BP at the onset of the first Korotkoff sound and diastolic BP at the disappearance of all Korotkoff sounds, using the nearest even number.
5. Average the readings	• Use an average based on ≥2 readings obtained on ≥2 occasions to estimate the individual's level of BP.
6. Provide BP readings to patient	• Provide patients the systolic/diastolic BP readings both verbally and in writing.

See Table 8 of the 2017 Hypertension Guideline for more information.
Adapted with permission from Mancia et al,[21] Pickering et al,[22] and Weir et al.[23]

Hypertensive Crises: Urgency vs Emergency

- *Hypertensive urgency* is severe BP elevation (higher than 180/120 mm Hg) in otherwise stable patients without acute or impending change in target organ damage or dysfunction. Many of these patients have withdrawn from antihypertensive therapy and have no evidence of acute target organ damage. Treat these patients by reinstituting or intensifying antihypertensive drug therapy and treating anxiety, as applicable.
- *Hypertensive emergency* is severe BP elevation (higher than 180/120 mm Hg) associated with evidence of new or worsening target organ damage.[24-27] The 1-year mortality rate of hypertensive emergencies is more than 79%, and the median survival is 10.4 months if left untreated.[28] Hypertensive emergencies demand immediate reduction of BP to prevent or limit further target organ damage.

Laboratory Tests and Other Diagnostic Procedures

Obtain laboratory measurements for all new hypertension patients to help identify CVD risk, establish a baseline for medication, and screen for secondary causes. Basic testing includes complete blood count, lipid profile, serum sodium, potassium, thyroid-stimulating hormone, urinalysis, and electrocardiogram, as well as tests that may be included in a comprehensive metabolic panel, such as fasting blood glucose, serum creatinine with estimated glomerular filtration rate, and calcium. Optional testing includes echocardiogram, uric acid, and urinary albumin-creatinine ratio.

Out-of-Office Monitoring of BP

Recommendation: *Use out-of-office BP measurements to help confirm hypertension and make adjustments to medication, along with telehealth counseling or clinical interventions.*[1]

Ambulatory and Home BP Monitoring

BP measurements taken outside the clinic, especially ambulatory BP measurements, tend to be lower than those taken in a clinical setting, and ambulatory BP monitors can supplement office readings. Providers usually set these monitors to read BP every 15 to 30 minutes during the day and every 15 minutes to 1 hour at night for a 24-hour period. Note that ambulatory BP uses different BP thresholds from office-based measurements (see the 2017 Hypertension Guideline for more information).

Because ambulatory BP monitoring provides a better method to predict long-term CVD outcomes than office BPs and can better predict long-term CVD outcomes compared with office BP measurements, it should be considered the reference standard.[29] But while ambulatory BP monitoring is the best out-of-office measurement method, home BP monitoring is often more practical.

To accurately record BP at home, patients should take at least 2 readings 1 minute apart each morning before medication and each evening before supper, and they should obtain weekly readings 2 weeks after a treatment change and the week before a clinic visit.

Masked and White Coat Hypertension

Ambulatory BP monitoring and home BP monitoring are useful techniques for detecting masked and white coat hypertension.[1] *Masked hypertension*—normal office readings but higher readings at home—and *white coat hypertension*—higher office readings but normal readings at home—can both lead to underestimating BP control rates. This is problematic because the risk of CVD and all-cause mortality in people with masked hypertension is similar to the risk in those with sustained hypertension, but the risk is about twice as high as those with normal BP readings.[30-34] The updated guideline presents an algorithm (Figure 1 in the 2017 Hypertension Guideline) to help detect masked and white coat hypertension, including the use of ambulatory or home BP monitoring.[1] Table 4 lists BP patterns based on office and out-of-office measurements.

Treating Hypertension

Manage all patient risk factors by integrating a comprehensive set of nonpharmacological and pharmacological strategies, and intensify BP management as patient BP and risk of future CVD events increase.

Recommendations for BP treatment thresholds and use of risk estimation to guide drug treatment for hypertension are included in Figure 1.

Blood Pressure Goal for Patients With Hypertension

Recommendation: *For adults with confirmed hypertension and known CVD, or a 10-year ASCVD risk of 10% or more, a BP target of less than 130/80 mm Hg is recommended.*[1]

Recommendation: *For adults with confirmed hypertension without additional markers of increased CVD risk, a BP target of less than 130/80 mm Hg may be reasonable.*[1]

The updated guideline indicates that this target BP may be reasonable for those without additional markers of increased CVD risk.[4] The available evidence indicates that a lower BP target is generally better than a higher one, and some patients will benefit from a systolic BP treatment goal below 120 mm Hg, especially those at high risk for CVD.[16]

Drug Therapy

Choice of Single vs Combination Drug Therapy

Recommendation: *Initiate antihypertensive drug therapy with 2 first-line agents of different classes for adults with stage 2 hypertension and BP more than 20/10 mm Hg higher than their target.*

The updated guideline recommends initiating antihypertensive therapy with 2 agents for stage 2 hypertension

Recommendation: *It is reasonable to initiate therapy with a single agent for adults with stage 1 hypertension and a goal of less than 130/80 mm Hg.*[1]

- This approach is reasonable in the very elderly, those with high CVD risk, or patients with a history of hypotension or drug-associated side effects.
  - Be cautious when initiating antihypertensive pharmacotherapy with 2 drugs in older patients because hypotension or orthostatic hypotension may develop.

TABLE 4. BP Patterns Based on Office and Out-of-Office Measurements

BP Category	Office/Clinic/Healthcare Setting	Home/Nonhealthcare/ Ambulatory BP Monitoring Setting
Normotensive	No hypertension	No hypertension
Sustained hypertension	Hypertension	Hypertension
Masked hypertension	No hypertension	Hypertension
Whitecoat hypertension	Hypertension	No hypertension

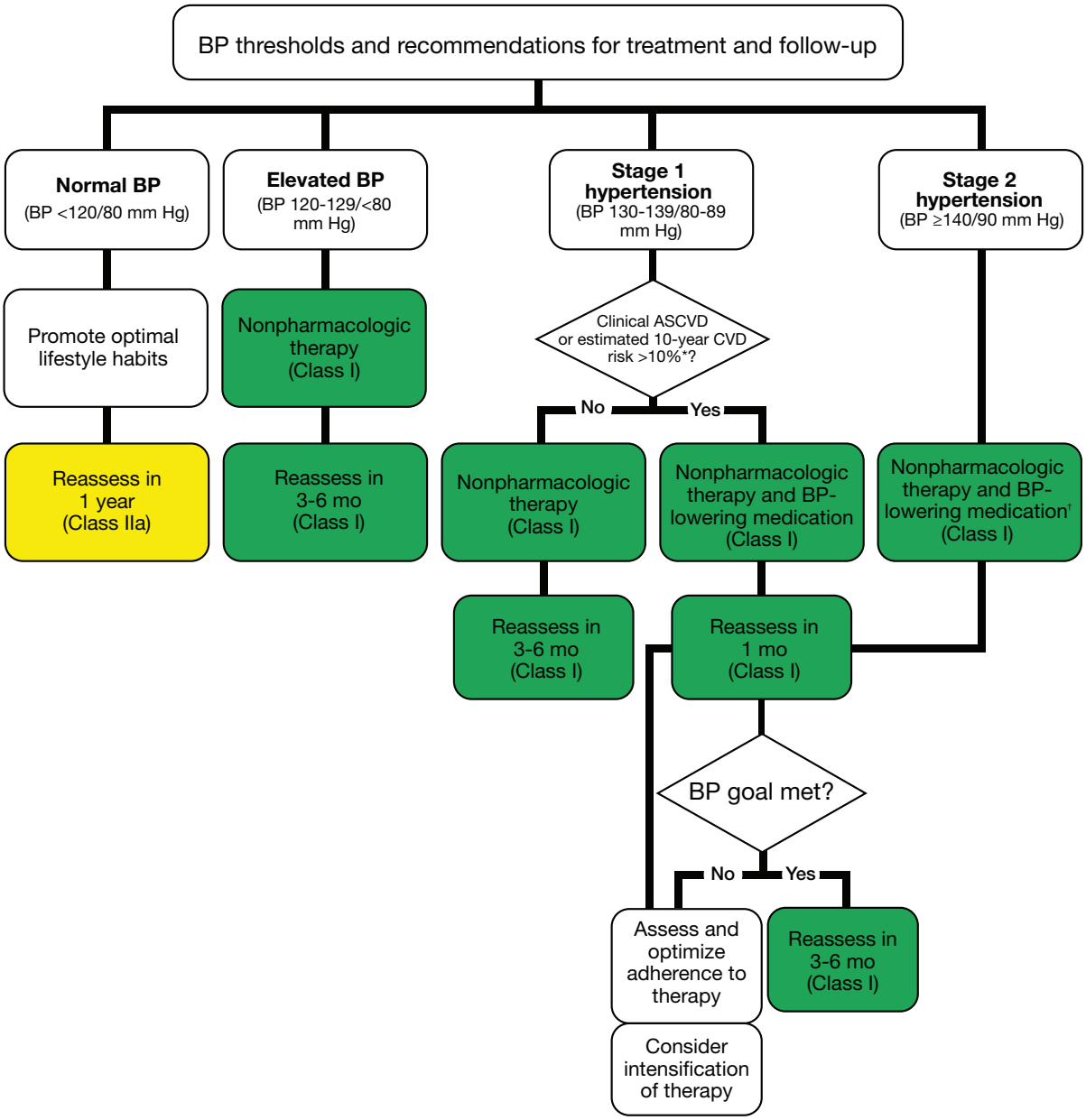

FIGURE 1. BP thresholds and recommendations for treatment and follow-up.
*†See Figure 4 in the 2017 Hypertension Guideline for additional information.

- Be aware that simultaneously administering more than 1 renin-angiotensin system blocker increases cardiovascular and renal risk.[35-37]

When initiating antihypertensive drug therapy, use first-line agents that include

- Thiazide diuretics
- Calcium channel blockers
- Angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs)[38,39]

Five drug classes have been shown to prevent CVD compared with placebo:

- Diuretics
- ACE inhibitors
- ARBs
- Calcium channel blockers
- β-Blockers[10,40]
  - β-Blockers were less effective than calcium channel blockers (36% lower risk) and thiazide diuretics (30% lower risk) in preventing stroke in the general population.

ACE inhibitors were notably less effective in preventing heart failure[41,42] and stroke compared with calcium channel blockers in black patients.[43,44]

- ARBs may be better tolerated than ACE inhibitors in black patients, with less cough and angioedema, but they offer no proven advantage over ACE inhibitors in preventing stroke or CVD in this population, making thiazide diuretics (especially chlorthalidone) or calcium channel blockers the best initial choice for single-drug therapy.

Table 5 lists primary and secondary oral antihypertensive drugs.

TABLE 5. Oral Antihypertensive Drugs

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Primary agents				
Thiazide or thiazide-like diuretics	Chlorthalidone	12.5-25	1	• Chlorthalidone preference based on prolonged half-life and proven trial reduction of CVD • Monitor for hyponatremia and hypokalemia, uric acid and calcium levels • Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy
	Hydrochlorothiazide	25-50	1	
	Indapamide	1.25-2.5	1	
	Metolazone	2.5-10	1	
ACE inhibitors	Benazepril	10-40	1 or 2	• Do not use in combination with ARBs or direct renin inhibitor • Increased risk of hyperkalemia, especially in patients with chronic kidney disease or in those on K^+ supplements, or K^+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ACE inhibitors • Avoid in pregnancy
	Captopril	12.5-150	2 or 3	
	Enalapril	5-40	1 or 2	
	Fosinopril	10-40	1	
	Lisinopril	10-40	1	
	Moexipril	7.5-30	1 or 2	
	Perindopril	4-16	1	
	Quinapril	10-80	1 or 2	
	Ramipril	2.5-10	1 or 2	
	Trandolapril	1-4	1	
ARBs	Azilsartan	40-80	1	• Do not use in combination with ACE/direct renin inhibitors • Increased risk of hyperkalemia in chronic kidney disease or in those on K^+ supplements or K^+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ARBs; patients with a history of angioedema with an ACE inhibitor can receive an ARB beginning 6 weeks after ACE inhibitor discontinued • Avoid in pregnancy
	Candesartan	8-32	1	
	Eprosartan	600-800	1 or 2	
	Irbesartan	150-300	1	
	Losartan	50-100	1 or 2	
	Olmesartan	20-40	1	
	Telmisartan	20-80	1	
	Valsartan	80-320	1	
CCB—dihydropyridines	Amlodipine	2.5-10	1	• Avoid use in patients with heart failure with reduced ejection fraction; amlodipine or felodipine may be used if required • Associated with dose-related pedal edema, which is more common in women than in men
	Felodipine	5-10	1	
	Isradipine	5-10	2	
	Nicardipine SR	5-20	1	
	Nifedipine LA	60-120	1	
	Nisoldipine	30-90	1	
CCB—nondihydropyridines	Diltiazem SR	180-360	2	• Avoid routine use with β-blockers due to increased risk of bradycardia and heart block • Do not use in patients with heart failure with reduced ejection fraction • Drug interactions with diltiazem and verapamil (*CYP3A4* major substrate and moderate inhibitor)
	Diltiazem ER	120-480	1	
	Verapamil IR	40-80	3	
	Verapamil SR	120-480	1 or 2	
	Verapamil-delayed onset ER (various forms)	100-480	1 (in the evening)	
Secondary agents				
Diuretics—loop	Bumetanide	0.5-4	2	• Preferred diuretics in patients with symptomatic heart failure • Preferred over thiazides in patients with moderate-to-severe chronic kidney disease (eg, GFR <30 mL/min)
	Furosemide	20-80	2	
	Torsemide	5-10	1	
Diuretics—potassium sparing	Amiloride	5-10	1 or 2	• Monotherapy agents minimally effective antihypertensives • Combination therapy of potassium-sparing diuretic with a thiazide can be considered in patients with hypokalemia on thiazide monotherapy • Avoid in patients with significant chronic kidney disease (eg, GFR <45 mL/min)
	Triamterene	50-100	1 or 2	

(Continued)

(Continued)

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Diuretics—aldosterone antagonists	Eplerenone	50-100	2	• Preferred agents in primary aldosteronism and resistant hypertension • Spironolactone associated with greater risk of gynecomastia and impotence compared to eplerenone • Common add-on therapy in resistant hypertension • Avoid use with K^+ supplements, other K^+-sparing diuretics or significant renal dysfunction • Eplerenone often requires twice daily dosing for adequate BP lowering
	Spironolactone	25-100	1	
β-Blockers—cardioselective	Atenolol	25-100	2	• β-Blockers are not recommended as first-line agents unless the patient has ischemic heart disease or heart failure • Preferred in patients with bronchospastic airway disease requiring a β-blocker • Bisoprolol and metoprolol succinate preferred in patients with heart failure with reduced ejection fraction • Avoid abrupt cessation
	Betaxolol	5-20	1	
	Bisoprolol	2.5-10	1	
	Metoprolol tartrate	100-400	2	
	Metoprolol succinate	50-200	1	
β-Blockers—cardioselective and vasodilatory	Nebivolol	5-40	1	• Induces nitric oxide-induced vasodilation • Avoid abrupt cessation
β-Blockers—noncardioselective	Nadolol	40-120	1	• Avoid in patients with reactive airways disease • Avoid abrupt cessation
	Propranolol IR	160-480	2	
	Propranolol LA	80-320	1	
β-Blockers—intrinsic sympathomimetic activity	Acebutolol	200-800	2	• Generally avoid, especially in patients with ischemic heart disease or heart failure • Avoid abrupt cessation
	Carteolol	2.5-10	1	
	Penbutolol	10-40	1	
	Pindolol	10-60	2	
β-Blockers—combined α- and β-receptor	Carvedilol	12.5-50	2	• Carvedilol preferred in patients with heart failure with reduced ejection fraction • Avoid abrupt cessation
	Carvedilol phosphate	20-80	1	
	Labetalol	200-800	2	
Direct renin inhibitor	Aliskiren	150-300	1	• Do not use in combination with ACE inhibitors or ARBs • Aliskiren is very long acting • Increased risk of hyperkalemia in chronic kidney disease or in those on K^+ supplements or K^+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Avoid in pregnancy
α_1-blockers	Doxazosin	1-8	1	• Associated with orthostatic hypotension, especially in older adults • May consider as second-line agent in patients with concomitant benign prostatic hyperplasia
	Prazosin	2-20	2 or 3	
	Terazosin	1-20	1 or 2	
Central α_1-agonist and other centrally acting drugs	Clonidine oral	0.1-0.8	2	• Generally reserved as last-line due to significant central nervous system adverse effects, especially in older adults • Avoid abrupt discontinuation of clonidine, which may induce hypertensive crisis; clonidine must be tapered to avoid rebound hypertension
	Clonidine patch	0.1-0.3	1 weekly	
	Methyldopa	250-1000	2	
	Guanfacine	0.5-2	1	
Direct vasodilators	Hydralazine	50-200	2 or 3	• Associated with sodium and water retention and reflex tachycardia; use with a diuretic and β-blocker • Hydralazine associated with drug-induced lupus-like syndrome at higher doses • Minoxidil associated with hirsutism and requires a loop diuretic; can induce pericardial effusion
	Minoxidil	5-100	1-3	

Lifestyle Therapy

Nonpharmacologic Interventions: Lifestyle Changes

Recommendation: *Use effective behavioral and motivational strategies to help adults with hypertension achieve a healthy lifestyle.*[45,46]

The updated guideline emphasizes the benefits of lifestyle changes to prevent and treat hypertension (Table 6). Nonpharmacologic therapy alone is especially useful for preventing hypertension, including in adults with elevated BP, and in the management of milder forms of hypertension.[47,48]

Follow-up and Patient Adherence to Treatment

Recommendations for Follow-up After Initial BP Evaluation

Recommendation: *After initial BP evaluation, treat adults who have elevated BP or stage 1 hypertension with nonpharmacologic therapy and follow up in 3 to 6 months. For adults with stage 1 hypertension and a 10-year CVD risk of 10% or higher, or adults with stage 2 hypertension, treat with a combination of nonpharmacologic and drug therapy and follow up in 1 month. Adults with a very high average BP should be promptly evaluated and started on drug therapy.*[1]

The updated guideline shows that systematic approaches to follow-up improve hypertension control. Patients' failure to follow recommended therapy is a major contributor to poor control of hypertension and a critical barrier to reducing CVD mortality. In fact, up to 25% of patients do not fill their initial prescription,[60-62] and during the first year of treatment, the average patient has possession of antihypertensive medications only 50% of the time. Only 1 in 5 patients follows treatment recommendations sufficiently to achieve the benefits observed in clinical trials.[63,64]

Because US adults have an 80% or higher lifetime risk of hypertension,[65] it is reasonable for adults with a normal BP to receive a BP evaluation every year.

Schedule follow-up evaluations at monthly intervals for adults initiating or adjusting a drug regimen for hypertension until control is achieved. The follow-up evaluation[2-4] should include assessing and evaluating

- BP control
- Orthostatic hypotension
- Side effects from medication therapy
- Adherence to pharmacological and nonpharmacological treatments
- Need for adjustment of medication dosage
- Laboratory testing (including electrolyte and renal function status)
- Other assessments of target organ damage

Simplifying medication regimens, either by less frequent dosing or by using combination drug therapy, improves the chance that patients will follow their recommended therapy. To identify and address areas for improvement in care, foster an encouraging, blame-free environment where patients are recognized for achieving treatment goals and permitted to answer honestly about obstacles to adherence.

Hypertension in Patients With Comorbidities

Recommendation: *Use BP-lowering medications in patients with clinical CVD (coronary heart disease, heart failure, and stroke) who have an average BP of 130/80 mm Hg or higher. For most patients with comorbidities, the BP treatment goal should be less than 130/80 mm Hg. For patients who are 65 years of age or older, or for those with heart failure and persistent high BP, a target systolic BP goal of less than 130 mm Hg is recommended. For some patients with comorbidities, the threshold is a BP level of 140/90 mm Hg (see Table 23 in the 2017 Hypertension Guideline).*

For patients with hypertension who have had either a stroke or a transient ischemic attack, and for those with hypertension but no clinical CVD whose 10-year risk of ASCVD is less than 10%, the BP threshold is 140/90 mm Hg or higher. Certain comorbidities may affect clinical decision-making in hypertension:

- Ischemic heart disease with reduced ejection fraction, heart failure with preserved ejection fraction, chronic kidney disease including renal transplantation, cerebrovascular disease, atrial fibrillation, peripheral artery disease, and metabolic syndrome

TABLE 6. Best Nonpharmacologic Interventions for Prevention and Treatment of Hypertension[49-59]*

Nonpharmacologic Intervention	Dose
Healthy diet: Use the Dietary Approaches to Stop Hypertension (DASH) dietary pattern	Diet rich in fruits, vegetables, whole grains, and low-fat dairy products with reduced content of saturated and total fat
Weight loss: Focus on losing excess weight/body fat	• Ideal body weight is best goal, but aim for at least 1 kg body weight reduction for most overweight adults. • Expect about 1 mm Hg for every 1 kg reduction in body weight.
Sodium: Reduce intake of dietary sodium	<1500 mg/day is optimal goal, but aim for at least 1000 mg/day reduction in most adults.
Potassium: Increase intake of dietary potassium	3500-5000 mg/day, preferably by consumption of a diet rich in potassium
Physical activity: Add aerobic exercises to weekly routine	• 90-150 min/week • 65%-75% heart rate reserve
Physical activity: Add dynamic resistance training to weekly routine	• 90-150 min/week • 50%-80% heart rate reserve, 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set
Physical activity: Add isometric resistance training to weekly routine	• 4 × 2 min (hand grip), 1 minute of rest between exercises, 30%-40% maximum voluntary contraction, 3 sessions/week • 8-10/week
Alcohol: Reduce consumption of alcohol	For those who drink alcohol, the recommended daily consumption is no more than 2 drinks for men and 1 drink for women.

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.

- The updated guideline recommends use of BP-lowering medications in patients with clinical CVD with an average BP greater than 130/80 mm Hg.
- The selection of medications for use in treating hypertension in patients with CVD is guided by their use for other compelling indications (eg, β-blockers after myocardial infarction).

The updated guideline provides varying guidelines for other patients with specific comorbidities:

- **ASCVD:** Patients are already at risk and need to have their BP controlled at 130/80 mm Hg (previously 140/90 mm Hg). The treatment algorithm now includes an assessment of ASCVD risk (the previous algorithm was based on BP values).
- **Stable ischemic heart disease:** Prescribe guideline-directed management and therapy. β-Blockers and/or calcium channel blockers are effective antihypertensive and antianginal agents.
- **Chronic heart failure:** Antecedent hypertension is present in 75% of patients.[66]
- **High risk for CVD:** Strong evidence supports treatment with antihypertensive medications and more-intensive intervention.
- **Heart failure with reduced ejection fraction:** Prescribe guideline-directed management and therapy to hypertensive patients with heart failure with reduced ejection fraction. Nondihydropyridine calcium channel blockers are not recommended.[67]
- **Heart failure with preserved ejection fraction:** For patients with heart failure and persistent hypertension after management of volume overload, prescribe ACE inhibitors or ARBs and β-blockers.[68-73]
- **Chronic kidney disease:** An ACE inhibitor (or an ARB if ACE inhibitor is not tolerated) is a preferred drug for treatment of hypertension for those with chronic kidney disease stage 3, or for stage 1 or 2 with albuminuria (300 mg/d or higher, or 300 mg/g albumin-to-creatinine ratio or higher or the equivalent in the first morning void). Combining an ARB with a direct renin inhibitor is contraindicated because of a greater risk for hyperkalemia and hypotension and lack of demonstrated benefit.[36]
- **Kidney transplantation:** Hypertension is common in patients who have received a transplant because of preexisting kidney disease, the effects of immunosuppressive medications, and allograft pathology.[74]
- **Stroke:** Treatment recommendations require recognition of stroke acuity, stroke type, and therapeutic objectives.
  - **Intracerebral hemorrhage:** Because of the data linking high BP with poor clinical outcomes[75-77] and some suggestive data for treatment in patients with modestly high initial systolic BP levels,[78,79] early comprehensive lowering of systolic BP in patients with markedly high systolic BP levels (>220 mm Hg) might be sensible.
  - **Acute ischemic stroke:** Early initiation or resumption of antihypertensive treatment is indicated only for patients who received a tissue-type plasminogen activator[80,81] or patients with a systolic BP higher than 220 mm Hg or diastolic BP higher than 120 mm Hg.
    - Rapidly reducing BP, even to lower levels within the hypertensive range, can be detrimental.
    - Restarting antihypertensive therapy to improve long-term BP control is reasonable after the first 24 hours for neurologically stable patients who have preexisting hypertension.[82-84]
- **Recurrent stroke:** Elevated BP increases the risk of a recurrent stroke, and guideline-recommended antihypertensive drug treatment to lower BP has been linked to a reduction in 1-year recurrent stroke risk.[85]
- **Peripheral artery disease (PAD):** Hypertension is a major risk factor for PAD, and patients with hypertension and PAD should be treated similarly to patients with hypertension without PAD.
- **Diabetes mellitus:** Combined with hypertension, diabetes mellitus greatly increases the risk of damage from CVD, resulting in a higher incidence of coronary heart disease, heart failure, peripheral artery disease, stroke, and CVD mortality.[86]
- **Metabolic syndrome:** Lifestyle modifications that focus on dietary modification, weight reduction, and exercise form the foundation of treatment. The optimal antihypertensive drug therapy for patients with hypertension and metabolic syndrome has not been clearly defined.[87] Although caution is recommended with thiazide diuretics in these patients because of their increased insulin resistance, dyslipidemia, and hyperuricemia and the increased risk of conversion to overt diabetes mellitus, no data are currently available that show a deterioration in cardiovascular or renal outcomes in patients treated with these agents.[87]
- **Atrial fibrillation:** Hypertension is a risk factor for atrial fibrillation and is present in more than 80% of patients with atrial fibrillation, making it by far the most common comorbid condition, regardless of age.[18] Control of hypertension is critical[88,89] and may prevent new-onset atrial fibrillation.[88]

Blood Pressure Components, Risk, and Comorbidities of Hypertension

Population Risk

According to reports published in 2010, high BP is the leading cause of death and disability-adjusted life years worldwide.[90,91] A follow-up study from the United States Nutrition Examination Survey found that more than 50% of deaths from coronary heart disease and stroke occurred among people with hypertension. In the population-based Atherosclerosis Risk in Communities study, 25% of the cardiovascular events (like coronary heart disease, coronary revascularization, stroke, or heart failure) were attributable to hypertension.[92] Figure 2 shows the percentage of these events attributable to hypertension for different populations.[93]

Observational Relationship

Observational studies have shown graded associations between higher systolic and diastolic BPs and increased CVD risk.[6,94] One meta-analysis revealed that 20 mm Hg higher

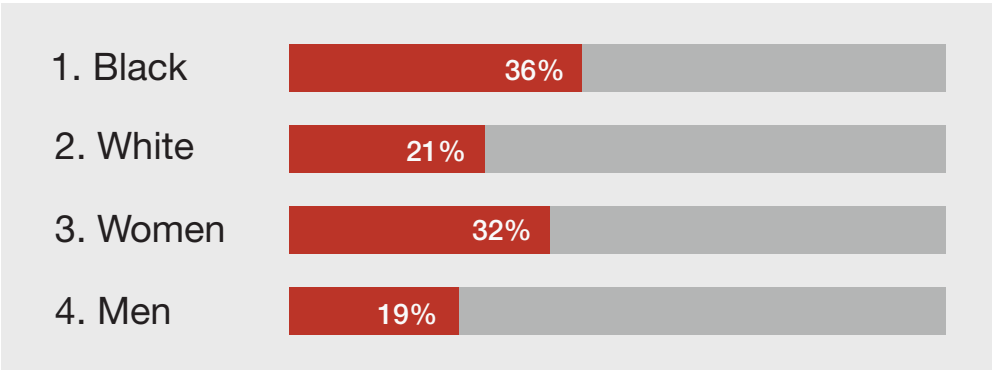

FIGURE 2. Percentage of cardiovascular events attributable to hypertension.[93]

FIGURE 3. Modifiable and fixed risk factors.

systolic BP and 10 mm Hg higher diastolic BP were each associated with a doubling in the risk of death from stroke, heart disease, or other vascular disease.[6] An observational study in more than 1 million adult patients older than 30 years found higher systolic and diastolic BPs were associated with increased risk for CVD incidence and angina, myocardial infarction, heart failure, stroke, peripheral artery disease, and abdominal aortic aneurysm, each evaluated separately.[94]

Coexistence of Hypertension and Related Chronic Conditions

RECOMMENDATION: *SCREEN FOR AND MANAGE OTHER MODIFIABLE CVD RISK FACTORS IN ADULTS WITH HYPERTENSION.*[1]

Many adult patients with hypertension have other CVD risk factors, and a higher percentage of adults with CVD risk factors have hypertension. Observational studies demonstrate that CVD risk factors frequently occur in combination, with 3 or more risk factors present in 17% of patients.[95] Figure 3 shows various modifiable and fixed risk factors.

Cardiovascular Target Organ Damage

Pulse wave velocity, carotid intima-media thickness, and/or coronary artery calcium score provide noninvasive estimates of vascular target organ injury and atherosclerosis; however, these are not routinely used as surrogate markers of hypertension.[96] Left ventricular hypertrophy is commonly measured by electrocardiography, echocardiography, or magnetic resonance imaging. While electrocardiography is considered a basic test in the routine evaluation of hypertension, echocardiography and magnetic resonance imaging are not universally recommended without other indications.[97,98]

Resistant Hypertension

A diagnosis of resistant hypertension is conferred when a patient takes 3 antihypertensive medications with complementary mechanisms of action (a diuretic should be one component) but does not achieve control or when BP control is achieved but requires 4 or more medications.[99] Multiple studies indicate common risk factors for resistant hypertension include older age, obesity, chronic kidney disease, black race, and diabetes mellitus. Treatment of resistant hypertension involves improving medication adherence, detection and correction of secondary hypertension, and addressing other patient characteristics.[100-102]

Cognitive Decline and Dementia

Vascular disease and its risk factors are present in a large number of patients with dementia, including Alzheimer's dementia.[103-105] Hypertension is also the primary risk factor for small vessel ischemic disease and cortical white matter abnormalities.[106-109] Systolic Hypertension in Europe (SYST-EUR)[110] and Perindopril Protection Against Recurrent Stroke (PROGRESS)[111] both showed statistically significant reductions in incident dementia.

Sexual Dysfunction and Hypertension

With the introduction of phosphodiesterase-5 inhibitors that can be administered with antihypertensive medications, there is now effective therapy for erectile dysfunction that has implications for systemic vascular disease.[112] These drugs have also been shown to lower BP and are recommended as a primary therapy for pulmonary hypertension.[113]

While the updated guideline means that more people will be diagnosed with high BP, nearly all of these newly categorized patients can treat their hypertension with lifestyle changes instead of medication.

Patients Undergoing Surgical Procedures

Controlling BP to below 130/80 mm Hg or target levels specified for an individual is reasonable before major elective procedures in either the inpatient or outpatient setting. If patients cannot take oral medications, they may be given intravenous medications (see Table 19 of the 2017 Hypertension Guideline) as necessary to control BP.

Prevalence and Lifetime Risk of Hypertension

While the updated guideline means that more people will be diagnosed with high BP, nearly all of these newly categorized patients can treat their hypertension with lifestyle changes instead of medication.

A much higher long-term population burden of hypertension occurs as BP increases with age. A study of white male medical students showed that 6.5% had developed hypertension by 45 years old and 37% had hypertension by age 65.[114] Additionally, a multiethnic study showed that the 40-year risk for developing hypertension for a 45 year old was 93% for black adults, 92% for Hispanic adults, 86% for white adults, and 84% for Chinese adults.[65]

Special Patient Groups

Special attention is needed for specific patient subgroups.

Race/Ethnicity

Recommendation: *In black adults with hypertension but without heart failure or chronic kidney disease, initial treatment should include a thiazide-type diuretic or calcium channel blocker.*[43,115-117]

Recommendation: *Two or more antihypertensive medications are recommended to achieve a BP target of less than 130/80 mm Hg in most adults with hypertension, especially in black adults.*[16,118,119]

Lifestyle changes are particularly important in black and Hispanic adults for preventing hypertension and as part of first-line or adjunctive therapy. However, patients in these ethnic groups may struggle to adopt these changes because of poor social support and financial considerations, which can limit access to basic necessities[120] including healthy food, medical care, and medications. When working with various ethnic groups, healthcare providers should also consider differences in learning styles and preferences, personal beliefs, values, and culture.[121,122]

In the United States, black adults have hypertension more often than Hispanic, white, Native American, and other adults defined by race or ethnicity. In Hispanic adults, lower control rates result primarily from lack of awareness and treatment,[123,124] whereas black adults' awareness and treatment are at least as high as white adults', but their hypertension is often more severe, and some medications are less effective in BP control.[125]

Pregnancy

Recommendation: *Women with hypertension who become pregnant should be transitioned to methyldopa, nifedipine, and/or labetalol during pregnancy.*

Recommendation: *Women with hypertension who become pregnant should not be treated with ACE inhibitors, ARBs, or direct renin inhibitors.*

Hypertension during pregnancy involves not only women who already have hypertension but also women who become hypertensive after pregnancy. Preeclampsia, a dangerous form of hypertension that some pregnant women develop, occurs in 3.8% of pregnancies and, along with eclampsia, accounts for 9% of maternal deaths in the United States.[126]

Managing BP during pregnancy is complicated because many medications, including ACE inhibitors and ARBs, could harm the fetus. For women with hypertension who become pregnant, transition them to methyldopa, nifedipine, or labetalol[127] during pregnancy.[128-132] β-Blockers and calcium channel blockers appear superior to other options for preventing preeclampsia.

Primary Causes of Hypertension

Hypertension has many causes, including environmental factors, genetic and childhood factors, and other secondary factors.

Environmental Risk Factors

Environmental risk factors for hypertension include obesity, lack of physical activity, sodium intake, and alcohol consumption. In fact, studies[133,134] have identified a direct relationship between body mass index and BP.[135,136] Studies have also shown that even modest levels of physical activity can decrease the risk of hypertension.[137] Excessive dietary sodium intake not only affects BP but also is independently associated with an increased risk of stroke,[138,139] CVD,[140] and other adverse outcomes.[141] In the United States, alcohol consumption may account for close to 10% of hypertension; however, it is also associated with a higher level of high-density lipoprotein cholesterol and, within modest ranges of intake, a lower level of coronary heart disease compared with abstinence.[142]

While excessive sodium can increase hypertension, a higher level of potassium tends to blunt the effect of sodium on BP,[143] and a lower sodium-potassium ratio correlates with a lower level of BP than that noted for corresponding levels of sodium or potassium on their own.[144] Epidemiological studies suggest that a lower sodium-potassium ratio may reduce the risk of CVD compared with the risk expected for corresponding levels of either substance separately.[145]

Drugs and Other Substances That Impair BP Control

Limit or discontinue use of substances that may raise BP, or consider prescribing alternative agents.[1] Many substances—over the counter, prescription, or even food substances—affect BP, so it's important to always ask patients about the substances they are taking and their dietary patterns. Substances that can affect BP include alcohol, amphetamines, antidepressants, antipsychotics, caffeine, decongestants, herbal supplements, immunosuppressants, nonsteroidal anti-inflammatory drugs, oral contraceptives, recreational drugs, systemic corticosteroids, and angiogenesis or tyrosine kinase inhibitors. For more information, see Table 14 of the 2017 Hypertension Guideline.

Genetic and Childhood Risk Factors

Many genes or gene combinations influence BP.[146,147] Factors that increase the likelihood of hypertension in adults include genetic factors and obesity in childhood, which increase the likelihood of a high childhood BP leading to future hypertension[148]; premature birth, which is associated with a 4 mm Hg higher systolic BP and 3 mm Hg higher diastolic BP in adulthood[149]; and low birth weight from other causes, which also contributes to higher BP in later life.[150]

Secondary Causes of Hypertension

Recommendation: *Screening is recommended for certain indications and physical examination findings or in adults with resistant hypertension. Referral to a physician with expertise in that particular form of condition/disease and hypertension may be reasonable for diagnostic confirmation and treatment.*[1]

Patients with secondary hypertension can achieve a cure or a marked improvement in BP control along with reduced risk of CVD. Common causes of secondary hypertension include renal parenchymal disease,[99,151] renovascular disease,[152] primary aldosteronism,[153,154] obstructive sleep apnea,[155] and drugs or alcohol.[156]

Uncommon causes of secondary hypertension include pheochromocytoma/paraganglioma,[157] Cushing syndrome,[158] hypothyroidism,[156] hyperthyroidism,[156] aortic coarctation,[159] primary hyperparathyroidism,[160] congenital adrenal hyperplasia,[161] mineralocorticoid excess syndromes other than primary aldosteronism,[161] and acromegaly.[162]

Figure 4 shows the recommendations for screening for secondary hypertension.[155,163-178]

Community Strategies to Improve Quality of Care: The Plan of Care for Hypertension

Recommendation: *Use a team-based care approach to treat adults with hypertension. Use electronic health records and patient registries to identify undiagnosed or undertreated patients and to improve hypertension control.*[1]

A specific plan of care for hypertension can lead to sustained reduction of BP and attainment of BP targets over several years. It's important to understand the modifiable and nonmodifiable determinants of health behaviors, including the social determinants of risk and outcomes. The following strategies may help improve patient adherence in communities that continue to struggle:

Improving quality of care for resource-constrained populations: Promote health literacy, paying attention to cultural sensitivities; prescribe once-daily generic medications to reduce complexity; make refill times longer once a stable regimen is achieved; and use scored tablets or pill cutters to decrease costs.

Structured, team-based care interventions for hypertension control: Implement a multidisciplinary team to improve the quality of hypertension care for patients with systems support for clinical decision-making (ie, treatment algorithm), collaboration, adherence to prescribed regimen, BP monitoring, and patient self-management. Team-based care to improve BP control is a health systems–level, organizational intervention that incorporates the patient, the patient's primary care provider, and other professionals such as cardiologists, nurses, pharmacists, physician assistants, dietitians, social workers, and community health workers. These professionals can provide process support and share the responsibilities of care with the patient's primary care provider.

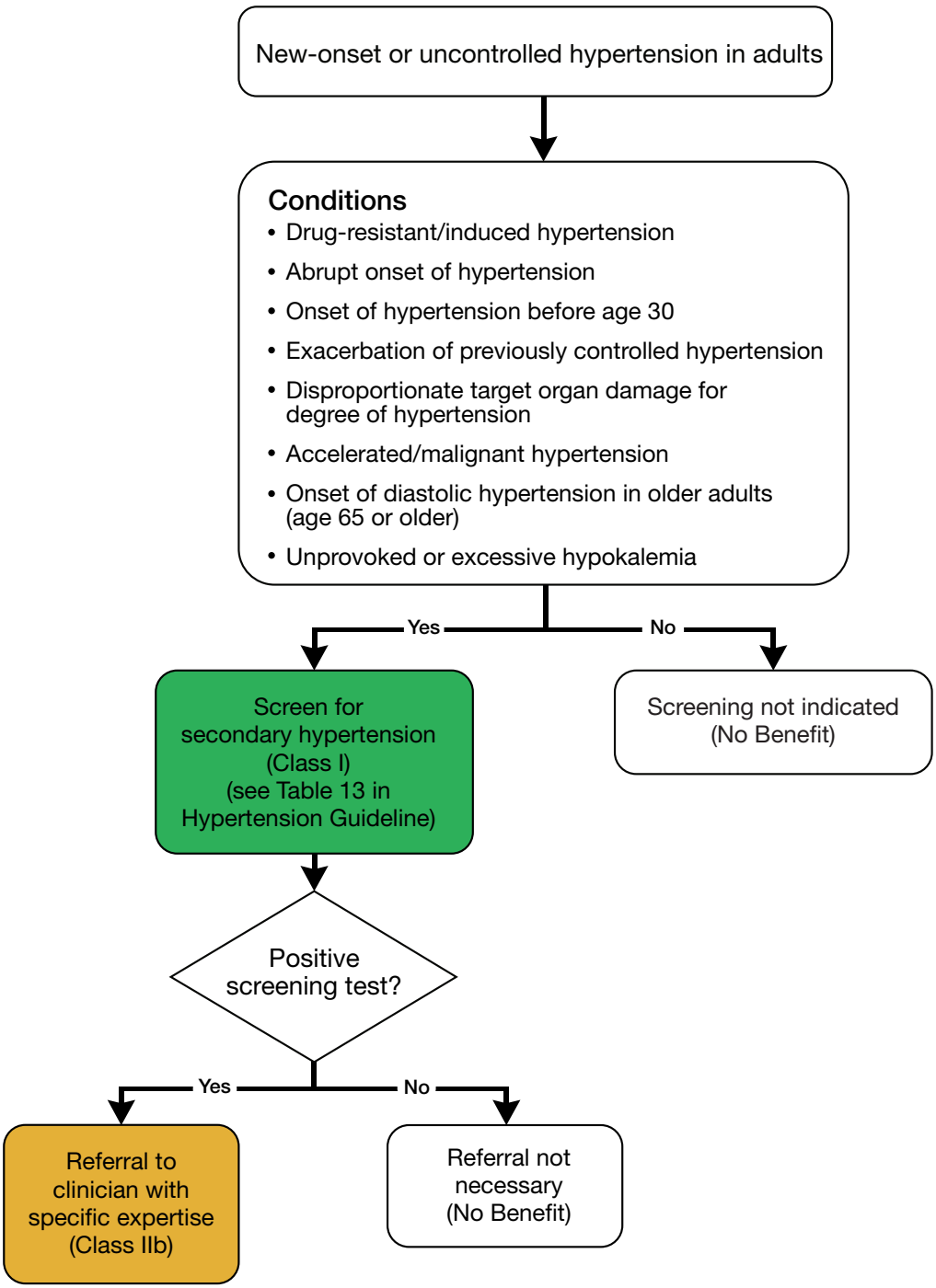

FIGURE 4. Screening for secondary hypertension.

Information technology–based strategies to promote hypertension control: More health systems are developing registries to identify undiagnosed or undertreated hypertension. To reduce undiagnosed hypertension and improve hypertension management, use a multipronged approach, which may include identifying at-risk patients by applying hypertension screening algorithms to electronic health record databases, scheduling BP measurements for at-risk patients, providing monthly feedback to physicians about at-risk patients who have yet to complete a BP measurement, and implementing electronic prompts for BP measurements whenever at-risk patients visit the clinic.[179,180]

Improving Quality of Care for Patients: Performance Measures and Quality Improvement Strategies

Performance measures assess the effectiveness of healthcare processes and whether desired patient outcomes are achieved.[181] Performance measures are often combined with quality-improvement strategies, such as certification or financial incentives tied to higher-quality care.[182]

Strategies and interventions aimed at reducing the quality gap for a group of patients who are representative of those encountered in routine practice have been effective in improving the hypertension care and outcomes across a wide variety of clinic and community settings.[183-189]

- **Financial incentives:** Reducing healthcare and medication copayments has shown improved outcomes for hypertension care in several US studies and in single studies in Finland, Israel, and Brazil.[190] The balance of evidence does not suggest that reducing medication copayments leads to an increase in overall healthcare expenditure.
- **Health literacy:** Encourage patients to change health behaviors, and provide information such as a specific physical activity regimen; a sodium-reduced meal plan with options for breakfast, lunch, and dinner; recommendations for sleep, rest, and relaxation; and suggestions for overcoming barriers to healthful grocery shopping, including reliable transportation to and from appointments with health providers and pharmacy visits.
- **Access to health insurance and medication assistance plans:** Learn how patients financially support and budget for their medical care and medications and then share advice on cost reductions, such as restructured payment plans. Ideally, patients may change their thinking on medication adherence and treatment goals.
- **Social and community services:** Patients with hypertension, particularly those with lower incomes, can better meet treatment goals with the help of strong local partnerships. Integrate social and community services to reinforce clinical treatment goals.

To download the full version of the 2017 Hypertension Guideline, please visit http://professional.heart.org/hypertension, or download a QR code reader app and scan the QR code below with your smartphone.

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