Advances in Cardiovascular Disease

30th Annual Convention and Reunion
UERM-CMAA, Inc. Annual Convention and Scientific Meeting
July 5-8, 2018

New Hypertension Guideline Recommendations for Adults

July 7, 2018

8:45-9:30am

Bayani B. Elma, MD

Former Clinical Associate Professor of Medicine

University of Maryland School of Medicine

Pre-Test Questions

1. The ACC and AHA led the development of the 2017 High Blood Pressure Guidelines with collaboration of the major pharmaceutical companies in order to update the standards of care established in the JNC 7.
2. The increase in the estimate of prevalence of hypertension in American adults and are now classified as having Stage 1 hypertension (SBP of 130-139) OR (DBP 80-89 mmHg) has resulted in a large increase in the percentage of U.S. adults for whom antihypertensive medication is recommended.
3. In low-risk adults with elevated BP or Stage 1 hypertension with low ASCVD-risk, BP should be repeated after 3-6 months of non-pharmacological therapy.
4. Chlorthalidone (12.5-25 mg) is the preferred diuretic because of long half-life and proven reduction of CVD risk.
5. The key finding of the ACCORD trial is that lowering systolic blood pressure to 120 mmHg results in significant cardiovascular benefit in high-risk patients hypertension compared with routine blood pressure control to <140 mmHg.

At the end of this presentation, you will:

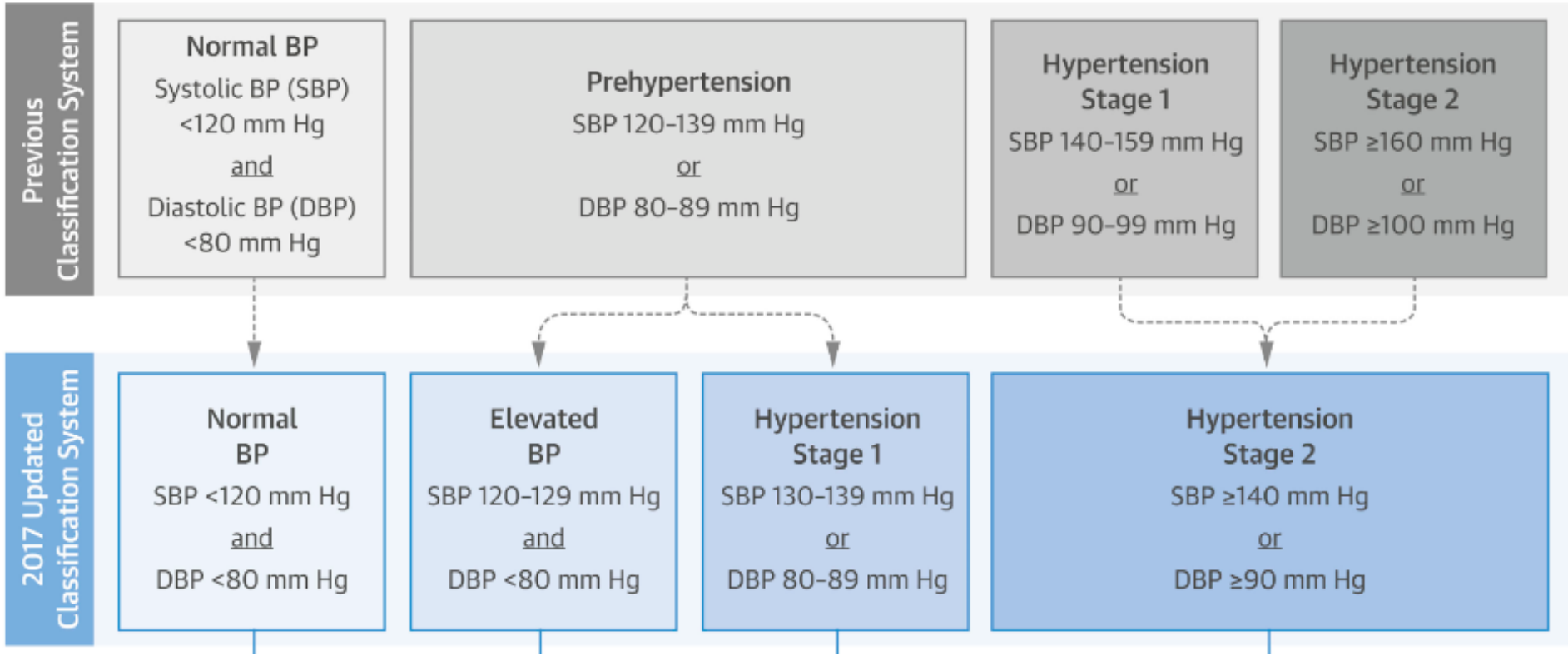
1. Understand the changes to the definition of hypertension
2. Understand the standards for measuring an accurate blood pressure
3. Understand recommendations for management of hypertension from lifestyle intervention to pharmacological therapy

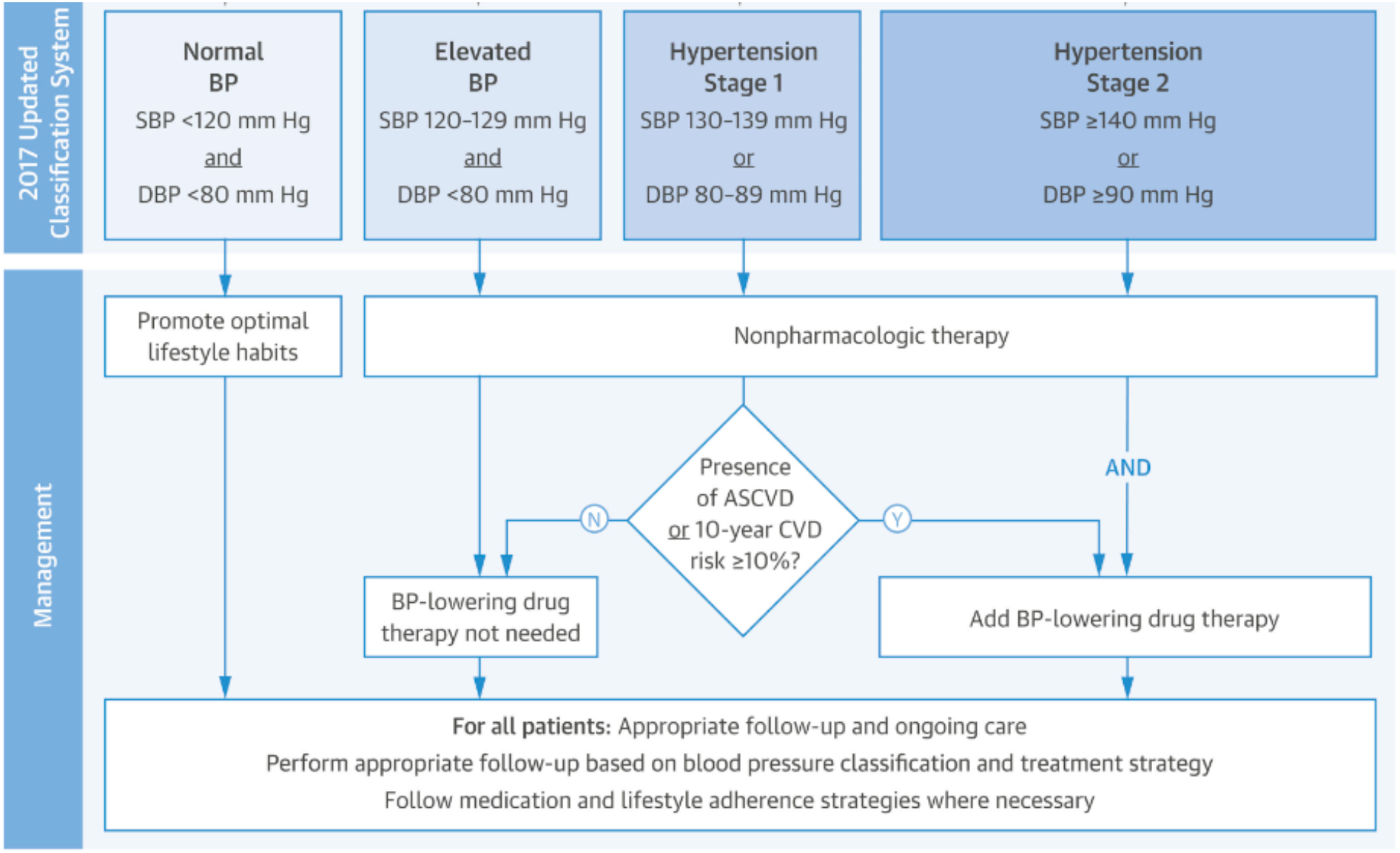
Definition

1. **Understand the changes to the definition of hypertension**
2. Understand the standards for measuring an accurate blood pressure
3. Understand recommendations for management of hypertension from lifestyle intervention to pharmacological therapy

Definition of High Blood Pressure

BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP.




2017 Updated Classification System
Normal BP
SBP <120 mm Hg
and
DBP <80 mm Hg
Elevated BP
SBP 120–129 mm Hg
and
DBP <80 mm Hg
Hypertension Stage 1
SBP 130–139 mm Hg
or
DBP 80–89 mm Hg
Hypertension Stage 2
SBP ≥140 mm Hg
or
DBP ≥90 mm Hg
Management
Promote optimal lifestyle habits
Nonpharmacologic therapy
Presence of ASCVD or 10-year CVD risk ≥10%?
N
Y
AND
BP-lowering drug therapy not needed
Add BP-lowering drug therapy
For all patients: Appropriate follow-up and ongoing care
Perform appropriate follow-up based on blood pressure classification and treatment strategy
Follow medication and lifestyle adherence strategies where necessary

ASCVD Risk Estimation

Calculated based on the following data:

- Gender
- Age
- Race
- Total Cholesterol
- HDL-Cholesterol
- Systolic Blood Pressure
- Hypertension Treatment
- Diabetes
- Smoker

Measurement

1. Understand the changes to the definition of hypertension
2. **Understand the standards for measuring an accurate blood pressure**
3. Understand recommendations for management of hypertension from lifestyle intervention to pharmacological therapy

Accurate Measurement of BP in the Office

Recommendation for Accurate Measurement of BP in the Office
For diagnosis and management of high BP, proper methods are recommended for accurate measurement and documentation of BP.

Checklist for Accurate Measurement of BP

Key Steps for Proper BP Measurements
Step 1: Properly prepare the patient.
Step 2: Use proper technique for BP measurements.
Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension.
Step 4: Properly document accurate BP readings.
Step 5: Average the readings.
Step 6: Provide BP readings to patient.

Common problems that account for inaccurate blood pressure measurement

When the patient has…	BP can appear higher by…
Cuff over clothing	10-40 mmHg
A full bladder	10-15 mmHg
A conversation or talking	10-15 mmHg
Unsupported arm	10 mmHg
An unsupported back	5-10 mmHg
Unsupported feet	5-10 mmHg
Crossed legs	2-8 mmHg

Corresponding Values of SBP/DBP for Clinic, HBPM, Daytime, Nighttime, and 24-Hour ABPM Measurements

Clinic	HBPM	Daytime ABPM	Nighttime ABPM	24-Hour ABPM
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; DBP diastolic blood pressure; HBPM, home blood pressure monitoring; and SBP, systolic blood pressure.

Masked and White Coat Hypertension

	Recommendations for Masked and White Coat Hypertension
	In adults with an untreated SBP greater than 130 mm Hg but less than 160 mm Hg or DBP greater than 80 mm Hg but less than 100 mm Hg, it is reasonable to screen for the presence of white coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension.
	In adults with white coat hypertension, periodic monitoring with either ABPM or HBPM is reasonable to detect transition to sustained hypertension.
	In adults being treated for hypertension with office BP readings not at goal and HBPM readings suggestive of a significant white coat effect, confirmation by ABPM can be useful.

Masked and White Coat Hypertension continued

	Recommendations for Masked and White Coat Hypertension
	In adults with untreated office BPs that are consistently between 120 mm Hg and 129 mm Hg for SBP or between 75 mm Hg and 79 mm Hg for DBP, screening for masked hypertension with HBPM (or ABPM) is reasonable.
	In adults on multiple-drug therapies for hypertension and office BPs within 10 mm Hg above goal, it may be reasonable to screen for white coat effect with HBPM (or ABPM).
	It may be reasonable to screen for masked uncontrolled hypertension with HBPM in adults being treated for hypertension and office readings at goal, in the presence of target organ damage or increased overall CVD risk.
	In adults being treated for hypertension with elevated HBPM readings suggestive of masked uncontrolled hypertension, confirmation of the diagnosis by ABPM might be reasonable before intensification of antihypertensive drug treatment.

Patient evaluation prior to management of hypertension

Before considering treatment options, you should have basic and consider optional laboratory tests for primary hypertension:

Basic testing	Fasting blood glucose*
	Complete blood count
	Lipid profile
	Serum creatinine with eGFR*
	Serum sodium, potassium, calcium*
	Thyroid-stimulating hormone
	Urinalysis
	Electrocardiogram
Optional testing	Echocardiogram
	Uric acid
	Urinary albumin to creatinine ratio

*May be included in a comprehensive metabolic panel.
eGFR indicates estimated glomerular filtration rate.

Management

1. Understand the changes to the definition of hypertension
2. Understand the standards for measuring an accurate blood pressure
3. **Understand recommendations for management of hypertension from lifestyle intervention to pharmacological therapy**

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg	-2 mm Hg

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
DASH indicates Dietary Approaches to Stop Hypertension; and SBP, systolic blood pressure.
Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH?
Available at: https://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-how-to.
Top 10 Dash Diet Tips. Available at: http://dashdiet.org/dash_diet_tips.asp

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension* continued

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Physical activity	Aerobic	• 90–150 min/wk • 65%–75% heart rate reserve	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	• 90–150 min/wk • 50%–80% 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set	-4 mm Hg	-2 mm Hg
	Isometric resistance	• 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk • 8–10 wk	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	• In individuals who drink alcohol, reduce alcohol† to: • Men: ≤2 drinks daily • Women: ≤1 drink daily	-4 mm Hg	-3 mm

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

†In the United States, one "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

Nonpharmacological Interventions

	Recommendations for Nonpharmacological Interventions
	Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese.
	A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension.
	Sodium reduction is recommended for adults with elevated BP or hypertension.
	Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion.

Nonpharmacological Interventions continued

	Recommendations for Nonpharmacological Interventions
	Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension.
	Adult men and women with elevated BP or hypertension 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 roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

General Principles of Drug Therapy

	Recommendation for General Principle of Drug Therapy
	Simultaneous use of an ACE inhibitor, ARB, and/or renin inhibitor is potentially harmful and is not recommended to treat adults with hypertension.

	Recommendation for Choice of Initial Medication
	For initiation of antihypertensive drug therapy, first-line agents include thiazide diuretics, CCBs, and ACE inhibitors or ARBs.

Oral Antihypertensive Drugs

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Primary Agents				
Thiazide or thiazide-type diuretics	**Chlorthalidone**	12.5–25	1	• Chlorthalidone preferred 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 CKD 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 inhibitors or direct renin inhibitor • Increased risk of hyperkalemia in CKD 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 ACEI can receive an ARB beginning 6 weeks after ACEI 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	

Oral Antihypertensive Drugs continued

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
CCB—dihydropyridines	**Amlodipine**	2.5–10	1	• Avoid use in patients with HFrEF; amlodipine or felodipine may be used if required • Associated with dose-related pedal edema, which is more common in women than 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 beta blockers due to increased risk of bradycardia and heart block • Do not use in patients with HFrEF • 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)	

Oral Antihypertensive Drugs continued

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Secondary Agents				
Diuretics—loop	**Bumetanide**	0.5–4	2	• Preferred diuretics in patients with symptomatic HF. Preferred over thiazides in patients with moderate-to-severe CKD (e.g., 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 CKD (e.g., GFR <45 mL/min)
	Triamterene	50–100	1 or 2	
Diuretics—aldosterone antagonists	**Eplerenone**	50–100	12	• 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	

Oral Antihypertensive Drugs continued

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Secondary Agents				
Beta blockers—cardioselective	**Atenolol**	25–100	12	• Beta blockers are not recommended as first-line agents unless the patient has IHD or HF • Preferred in patients with bronchospastic airway disease requiring a beta blocker • Bisoprolol and metoprolol succinate preferred in patients with HFrEF • Avoid abrupt cessation
	Betaxolol	5–20	1	
	Bisorolol	2.5–10	1	
	Metoprolol tartrate	100–400	2	
	Metoprolol succinate	50–200	1	
Beta blockers—cardioselective and vasodilatory	**Nebivolol**	5–40	1	• Induces nitric oxide-induced vasodilation • Avoid abrupt cessation
Beta 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	
Beta blockers—intrinsic sympathomimetic activity	**Acebutolol**	200–800	2	• Generally avoid, especially in patients with IHD or HF • Avoid abrupt cessation
	Carteolol	2.5–10	1	
	Penbutolol	10–40	1	
	Pindolol	10–60	2	

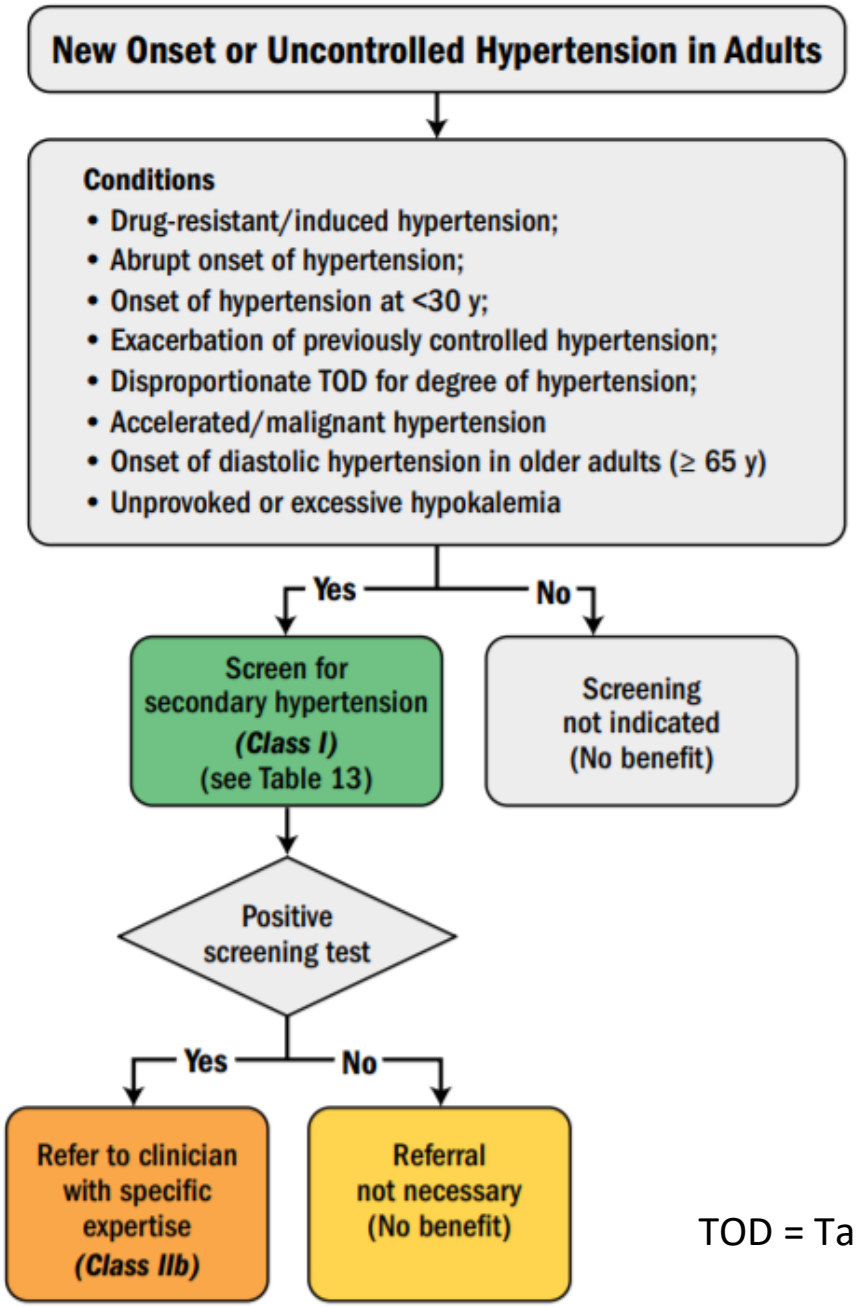
Frequently Used Medications and Other Substances That May Cause Elevated BP

Agent	Possible Management Strategy
Alcohol	• Limit alcohol to ≤1 drink daily for women and ≤2 drinks for men
Amphetamines (e.g., amphetamine, methylphenidate dexmethylphenidate, dextroamphetamine)	• Discontinue or decrease dose • Consider behavioral therapies for ADHD
Antidepressants (e.g., MAOIs, SNRIs, TCAs)	• Consider alternative agents (e.g., SSRIs,) depending on indication • Avoid tyramine containing foods with MAOIs
Atypical antipsychotics (e.g., clozapine, olanzapine)	• Discontinue or limit use when possible • Consider behavior therapy where appropriate • Lifestyle modification (Section 6.2) • Consider alternative agents associated with lower risk of weight gain, diabetes mellitus, and dyslipidemia (e.g., aripiprazole, ziprasidone).
Caffeine	• Generally limit caffeine intake to <300 mg/d • Avoid use in patients with uncontrolled hypertension • Coffee use in patients with hypertension associated with acute increases in BP; long-term use not associated with increased BP or CVD
Decongestants (e.g., phenylephrine, pseudoephedrine)	• Use for shortest duration possible and avoid in severe or uncontrolled hypertension • Consider alternative therapies (e.g., nasal saline, intranasal corticosteroids, antihistamines) as appropriate

Frequently Used Medications and Other Substances That May Cause Elevated BP

Agent	Possible Management Strategy
Herbal supplements (e.g., Ma Huang [ephedra], St. John's wort [with MAO inhibitors, yohimbine])	• Avoid use
Immunosuppressants (e.g., cyclosporine)	• Consider converting to tacrolimus, which may be associated with less effects on BP
Oral contraceptives	• Use low-dose (e.g., 20–30 mcg ethinyl estradiol) agents or a progestin-only form of contraception and/or consider alternative forms of birth control where appropriate (e.g., barrier, abstinence, IUD) • Avoid use in women with uncontrolled hypertension
NSAIDs	• Avoid systemic NSAIDs when possible • Consider alternative analgesics (e.g., acetaminophen, tramadol, topical NSAIDs,) depending on indication and risk
Recreational drugs (e.g., "bath salts" [MDPV], cocaine, methamphetamine, etc.)	• Discontinue and/or avoid use
Systemic corticosteroids (e.g., dexamethasone, fludrocortisone, methylprednisolone, prednisone, prednisolone)	• Avoid or limit use when possible • Consider alternative modes of administration (e.g., inhaled, topical) when feasible
Angiogenesis inhibitor (eg. bevacizumab) and tyrosine kinase inhibitors (eg. sunitinib, sorafenif)	• Initiate or intensify antihypertensive therapy

Screening for Secondary Hypertension



TOD = Target organ damage

Clinician's Sequential Flow Chart for the Management of Hypertension

Clinician's Sequential Flow Chart for the Management of Hypertension
Measure office BP accurately
Detect white coat hypertension or masked hypertension by using ABPM and HBPM
Evaluate for secondary hypertension
Identify target organ damage
Introduce lifestyle interventions
Identify and discuss treatment goals
Use ASCVD risk estimation to guide BP threshold for drug therapy
Align treatment options with comorbidities
Account for age, race, ethnicity, sex, and special circumstances in antihypertensive treatment
Initiate antihypertensive pharmacological therapy
Insure appropriate follow-up
Use team-based care
Connect patient to clinician via telehealth
Detect and reverse nonadherence (e.g. KardiAssure)
Detect white coat effect or masked uncontrolled hypertension
Use health information technology for remote monitoring and self-monitoring of BP

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

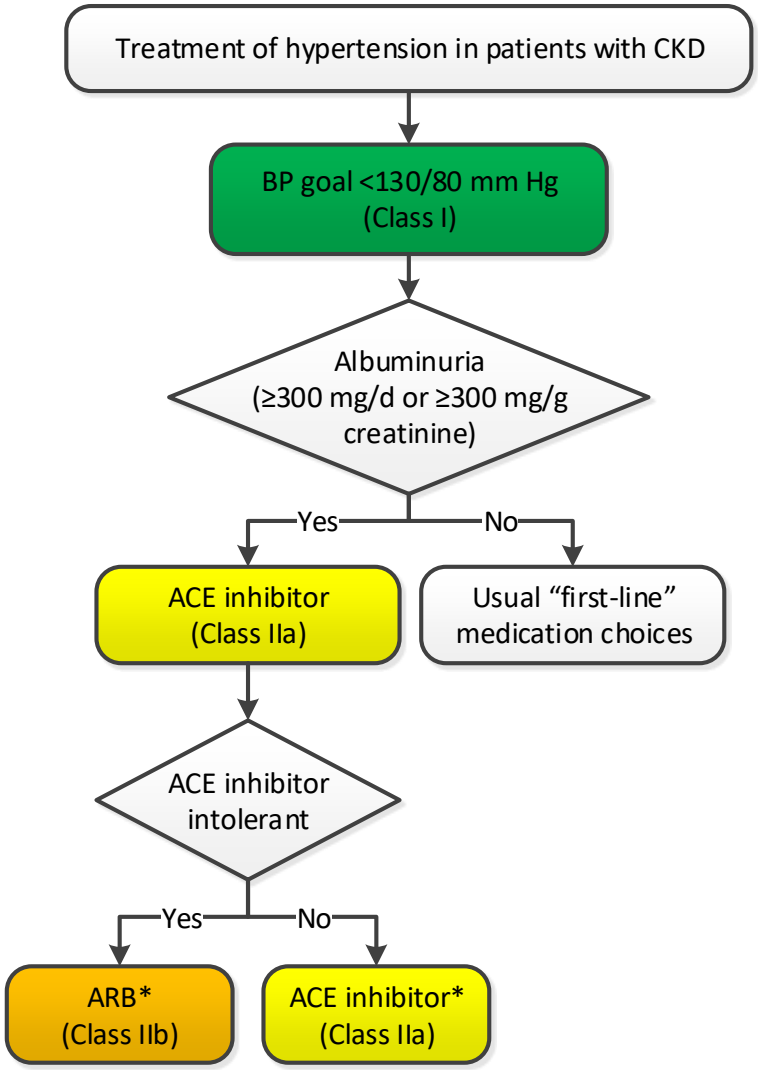
Diabetes Mellitus

	Recommendations for Treatment of Hypertension in Patients With DM
	In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg.
	In adults with DM and hypertension, all first-line classes of antihypertensive agents (i.e., diuretics, ACE inhibitors, ARBs, and CCBs) are useful and effective.
	In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria.

Chronic Kidney Disease

	Recommendations for Treatment of Hypertension in Patients With CKD
	Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg.
	In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria [≥300 mg/d, or ≥300 mg/g albumin-to-creatinine ratio or the equivalent in the first morning void]), treatment with an ACE inhibitor is reasonable to slow kidney disease progression.
	In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria [≥300 mg/d, or ≥300 mg/g albumin-to-creatinine ratio in the first morning void]), treatment with an ARB may be reasonable if an ACE inhibitor is not tolerated.

Management of Hypertension in Patients With CKD



*CKD stage 3 or higher or stage 1 or 2 with albuminuria ≥300 mg/d or ≥300 mg/g creatinine.

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP blood pressure; and CKD, chronic kidney disease.

Heart Failure

	Recommendation for Prevention of HF in Adults With Hypertension
	In adults at increased risk of HF, the optimal BP in those with hypertension should be less than 130/80 mm Hg.

Post-Test Questions

1. **False.** The ACC and AHA led the development of the 2017 High Blood Pressure Guidelines with collaboration of the **National Heart, Lung, and Blood Institute (NHLBI)** in order to update the standards of care established in the JNC 7.
2. **False.** The increase in the estimate of prevalence of hypertension in American adults and are now classified as having Stage 1 hypertension (SBP of 130-139) OR (DBP 80-89 mmHg) has resulted in a **small** increase in the percentage of U.S. adults for whom antihypertensive medication is recommended.
3. **True.**
4. **True.**
5. **False.** It is the **SPRINT (Systolic Blood Pressure Intervention Trial) and not the ACCORD (Action to Control Cardiovascular Disease Risk in Diabetes)** key finding that lowering systolic blood pressure to 120 mmHg results in a 33% reduction in cardiovascular events and a 25% reduction in death.

Thank You