2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

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Publication Information

This slide set is adapted from the 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

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Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care*

(Updated August 2015)

CLASS (STRENGTH) OF RECOMMENDATION

CLASS I (STRONG) — Benefit >>> Risk

Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

CLASS IIa (MODERATE) — Benefit >> Risk

Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

CLASS IIb (WEAK) — Benefit ≥ Risk

Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

CLASS III: No Benefit (MODERATE) — Benefit = Risk
(Generally, LOE A or B use only)

Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

CLASS III: Harm (STRONG) — Risk > Benefit

Suggested phrases for writing recommendations:
- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

LEVEL (QUALITY) OF EVIDENCE‡

LEVEL A
- High-quality evidence‡ from more than 1 RCT
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

LEVEL B-R (Randomized)
- Moderate-quality evidence‡ from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

LEVEL B-NR (Nonrandomized)
- Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

LEVEL C-LD (Limited Data)
- Randomized or nonrandomized observational or registry studies with limitations of design or execution
- Meta-analyses of such studies
- Physiological or mechanistic studies in human subjects

LEVEL C-EO (Expert Opinion)

Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

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Systematic Review Questions on High BP in Adults

Question Number	Question
1	Is there evidence that self-directed monitoring of BP and/or ambulatory BP monitoring are superior to office-based measurement of BP by a healthcare worker for 1) preventing adverse outcomes for which high BP is a risk factor and 2) achieving better BP control?
2	What is the optimal target for BP lowering during antihypertensive therapy in adults?
3	In adults with hypertension, do various antihypertensive drug classes differ in their comparative benefits and harms?
4	In adults with hypertension, does initiating treatment with antihypertensive pharmacological monotherapy versus initiating treatment with 2 drugs (including fixed-dose combination therapy), either of which may be followed by the addition of sequential drugs, differ in comparative benefits and/or harms on specific health outcomes?

BP indicates blood pressure.

BP Measurement Definitions

BP Measurement	Definition
SBP	First Korotkoff sound*
DBP	Fifth Korotkoff sound*
Pulse pressure	SBP minus DBP
Mean arterial pressure	DBP plus one third pulse pressure†
Mid-BP	Sum of SBP and DBP, divided by 2

*See Section 4 for a description of Korotkoff sounds.
†Calculation assumes normal heart rate .
BP indicates blood pressure; DBP, diastolic blood pressure; and SBP, systolic blood pressure.

BP and CVD Risk

Coexistence of Hypertension and Related Chronic Conditions

COR	LOE	Recommendation for Coexistence of Hypertension and Related Chronic Conditions
I	B-NR	Screening for and management of other modifiable CVD risk factors are recommended in adults with hypertension.

CVD Risk Factors Common in Patients With Hypertension

Modifiable Risk Factors*	Relatively Fixed Risk Factors†
• Current cigarette smoking, secondhand smoking • Diabetes mellitus • Dyslipidemia/hypercholesterolemia • Overweight/obesity • Physical inactivity/low fitness • Unhealthy diet	• CKD • Family history • Increased age • Low socioeconomic/educational status • Male sex • Obstructive sleep apnea • Psychosocial stress

*Factors that can be changed and, if changed, may reduce CVD risk.
†Factors that are difficult to change (CKD, low socioeconomic/educational status, obstructive sleep apnea, cannot be changed (family history, increased age, male sex), or, if changed through the use of current intervention techniques, may not reduce CVD risk (psychosocial stress).
CKD indicates chronic kidney disease; and CVD, cardiovascular disease.

Classification of BP

Definition of High BP

COR	LOE	Recommendation for Definition of High BP
I	B-NR	BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP.

Categories of BP in Adults*

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.
BP indicates blood pressure (based on an average of ≥2 careful readings obtained on ≥2 occasions, as detailed in DBP, diastolic blood pressure; and SBP systolic blood pressure.

Prevalence of Hypertension Based on 2 SBP/DBP Thresholds*†

	SBP/DBP ≥130/80 mm Hg or Self-Reported Antihypertensive Medication†		SBP/DBP ≥140/90 mm Hg or Self-Reported Antihypertensive Medication‡	
Overall, crude	46%		32%	
	Men (n=4717)	Women (n=4906)	Men (n=4717)	Women (n=4906)
Overall, age-sex adjusted	48%	43%	31%	32%
Age group, y				
20–44	30%	19%	11%	10%
45–54	50%	44%	33%	27%
55–64	70%	63%	53%	52%
65–74	77%	75%	64%	63%
75+	79%	85%	71%	78%
Race-ethnicity §				
Non-Hispanic White	47%	41%	31%	30%
Non-Hispanic Black	59%	56%	42%	46%
Non-Hispanic Asian	45%	36%	29%	27%
Hispanic	44%	42%	27%	32%

The prevalence estimates have been rounded to the nearest full percentage.
*130/80 and 140/90 mm Hg in 9623 participants (≥20 years of age) in NHANES 2011–2014.
†BP cutpoints for definition of hypertension in the present guideline.
‡BP cutpoints for definition of hypertension in JNC 7.
§ Adjusted to the 2010 age-sex distribution of the U.S. adult population.
BP indicates blood pressure; DBP, diastolic blood pressure; NHANES, National Health and Nutrition Examination Survey; and SBP, systolic blood pressure.

Measurement of BP

Accurate Measurement of BP in the Office

COR	LOE	Recommendation for Accurate Measurement of BP in the Office
I	C-EO	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.

Selection Criteria for BP Cuff Size for Measurement of BP in Adults

Arm Circumference	Usual Cuff Size
22–26 cm	Small adult
27–34 cm	Adult
35–44 cm	Large adult
45–52 cm	Adult thigh

Out-of-Office and Self-Monitoring of BP

COR	LOE	Recommendation for Out-of-Office and Self-Monitoring of BP
I	A^{SR}	Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions.

SR indicates systematic review.

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

COR	LOE	Recommendations for Masked and White Coat Hypertension
IIa	B-NR	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.
IIa	C-LD	In adults with white coat hypertension, periodic monitoring with either ABPM or HBPM is reasonable to detect transition to sustained hypertension.
IIa	C-LD	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 (cont.)

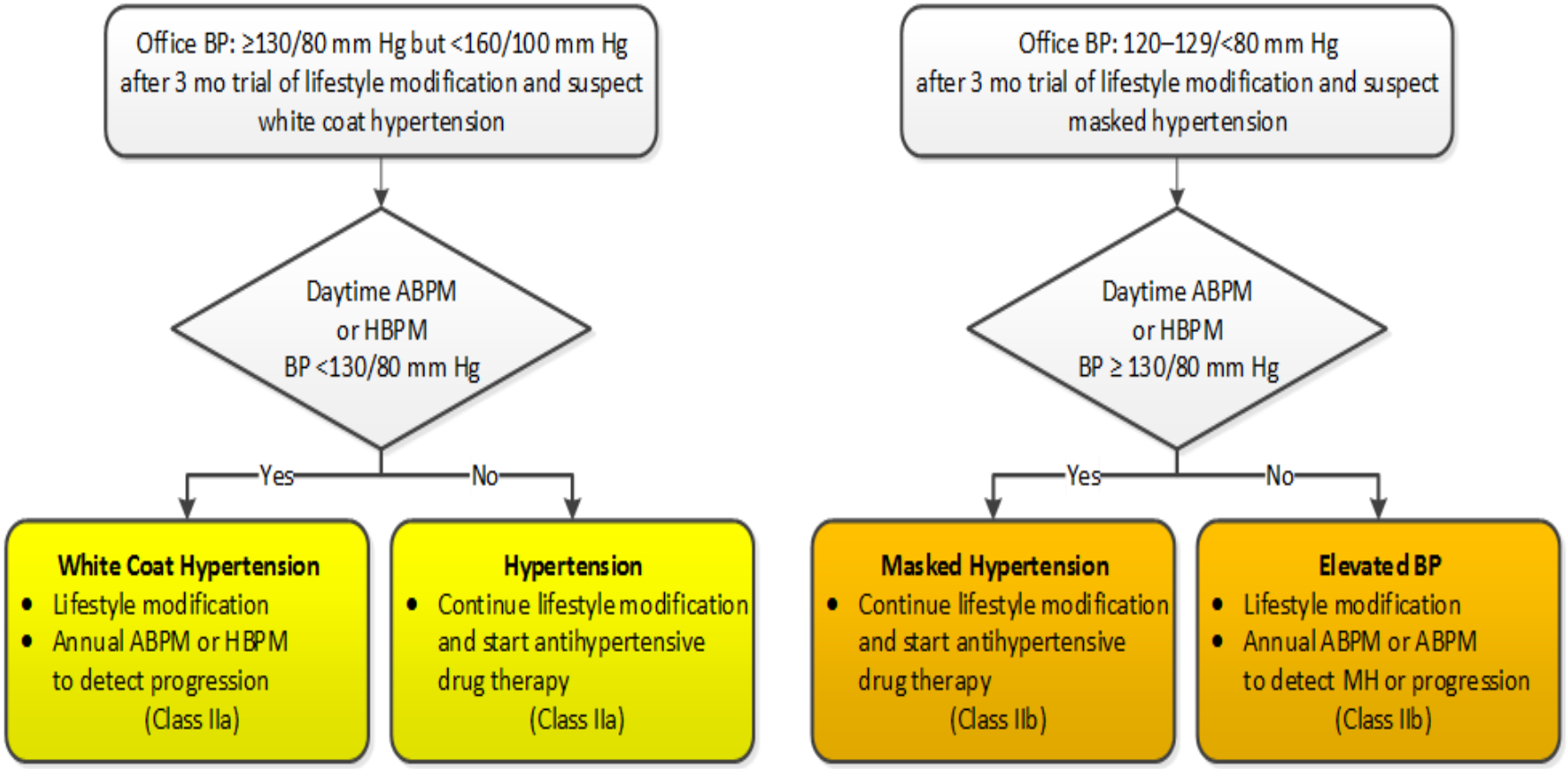
COR	LOE	Recommendations for Masked and White Coat Hypertension
IIa	B-NR	In adults with untreated office BPs that are consistently between 120 mm Hg and 129 mm Hg for SBP or between 75 mm Hg and 79 mm Hg for DBP, screening for masked hypertension with HBPM (or ABPM) is reasonable.
IIb	C-LD	In adults on 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).
IIb	C-EO	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.
IIb	C-EO	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.

BP Patterns Based on Office and Out-of-Office Measurements

	Office/Clinic/Healthcare Setting	Home/Nonhealthcare/ ABPM Setting
Normotensive	No hypertension	No hypertension
Sustained hypertension	Hypertension	Hypertension
Masked hypertension	No hypertension	Hypertension
White coat hypertension	Hypertension	No hypertension

ABPM indicates ambulatory blood pressure monitoring; and BP, blood pressure.

Detection of White Coat Hypertension or Masked Hypertension in Patients Not on Drug Therapy



Colors correspond to Class of Recommendation in Table 1.
ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; and HBPM, home blood pressure monitoring.

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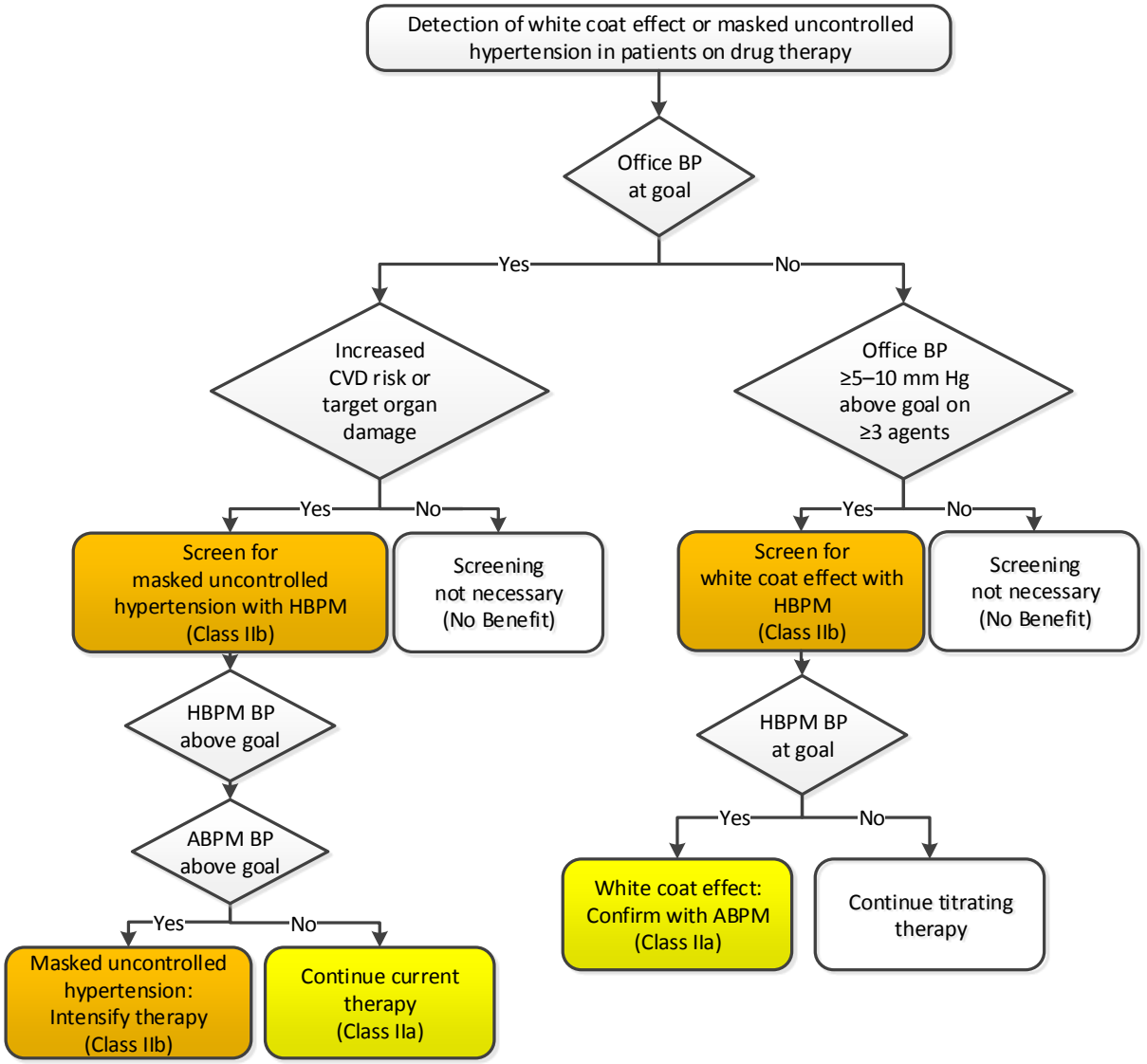
Detection of White Coat Effect or Masked Uncontrolled Hypertension in Patients on Drug Therapy



Colors correspond to Class of Recommendation in Table 1.
ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; and HBPM, home blood pressure monitoring.

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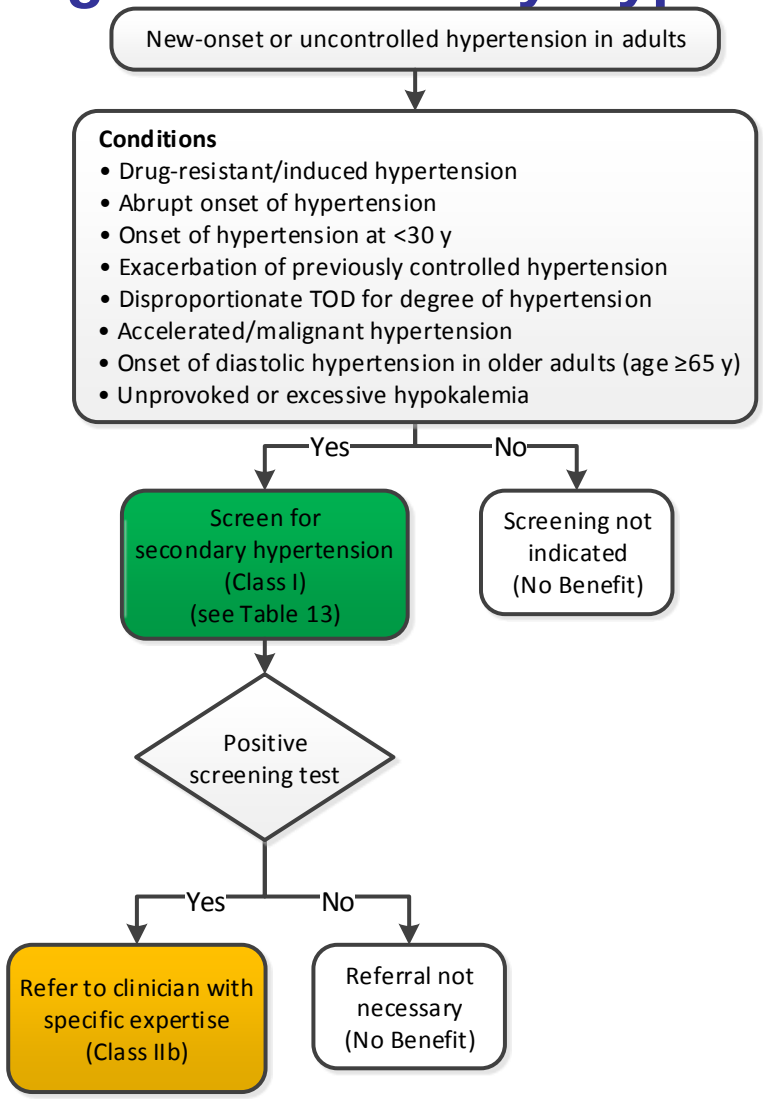
Causes of Hypertension

Secondary Forms of Hypertension

COR	LOE	Recommendations for Secondary Forms of Hypertension
I	C-EO	Screening for specific form(s) of secondary hypertension is recommended when the clinical indications and physical examination findings are present or in adults with resistant hypertension.
IIb	C-EO	If an adult with sustained hypertension screens positive for a form of secondary hypertension, referral to a physician with expertise in that form of hypertension may be reasonable for diagnostic confirmation and treatment.

Screening for Secondary Hypertension



Colors correspond to Class of Recommendation in Table 1 .
TOD indicates target organ damage (e.g., cerebrovascular disease, hypertensive retinopathy, left ventricular hypertrophy, left ventricular dysfunction, heart failure, coronary artery disease, chronic kidney disease, albuminuria, peripheral artery disease).

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Causes of Secondary Hypertension With Clinical Indications

Common causes
Renal parenchymal disease
Renovascular disease
Primary aldosteronism
Obstructive sleep apnea
Drug or alcohol induced
Uncommon causes
Pheochromocytoma/paraganglioma
Cushing's syndrome
Hypothyroidism
Hyperthyroidism
Aortic coarctation (undiagnosed or repaired)
Primary hyperparathyroidism
Congenital adrenal hyperplasia
Mineralocorticoid excess syndromes other than primary aldosteronism
Acromegaly

Primary Aldosteronism

COR	LOE	Recommendations for Primary Aldosteronism
I	C-EO	In adults with hypertension, screening for primary aldosteronism is recommended in the presence of any of the following concurrent conditions: resistant hypertension, hypokalemia (spontaneous or substantial, if diuretic induced), incidentally discovered adrenal mass, family history of early-onset hypertension, or stroke at a young age (<40 years).
I	C-LD	Use of the plasma aldosterone: renin activity ratio is recommended when adults are screened for primary aldosteronism.
I	C-EO	In adults with hypertension and a positive screening test for primary aldosteronism, referral to a hypertension specialist or endocrinologist is recommended for further evaluation and treatment.

Renal Artery Stenosis

COR	LOE	Recommendations for Renal Artery Stenosis
I	A	Medical therapy is recommended for adults with atherosclerotic renal artery stenosis.
IIb	C-EO	In adults with renal artery stenosis for whom medical management has failed (refractory hypertension, worsening renal function, and/or intractable HF) and those with nonatherosclerotic disease, including fibromuscular dysplasia, it may be reasonable to refer the patient for consideration of revascularization (percutaneous renal artery angioplasty and/or stent placement).

Obstructive Sleep Apnea

COR	LOE	Recommendation for Obstructive Sleep Apnea
IIb	B-R	In adults with hypertension and obstructive sleep apnea, the effectiveness of continuous positive airway pressure (CPAP) to reduce BP is not well established.

Nonpharmacological Interventions

Nonpharmacological Interventions

COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese.
I	A	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.
I	A	Sodium reduction is recommended for adults with elevated BP or hypertension.
I	A	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 (cont.)

COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension.
I	A	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).

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacologi-cal 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* (cont.)

	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).

Patient Evaluation

Basic and 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.

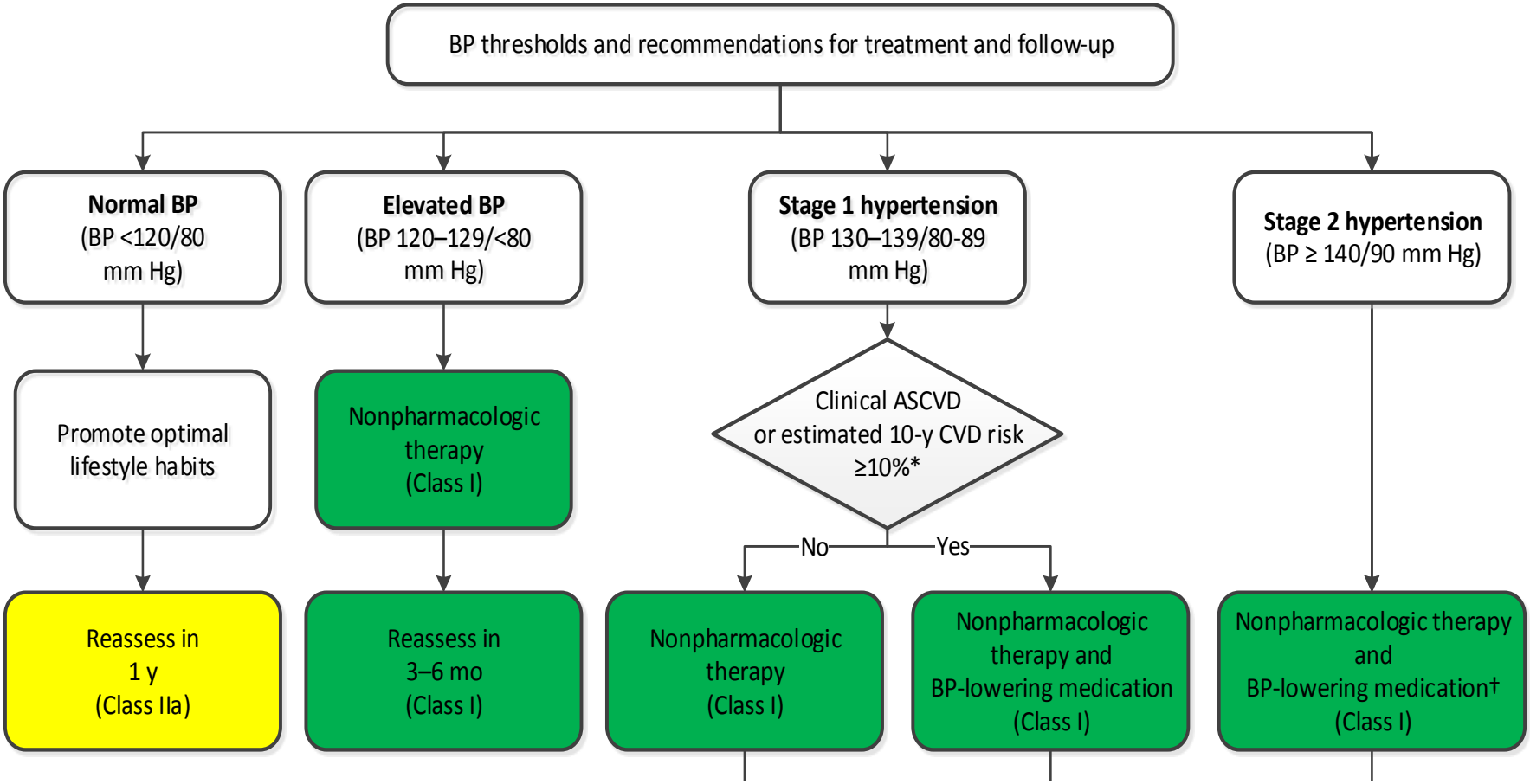
Treatment of High BP

BP Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension

COR	LOE	Recommendations for BP Treatment Threshold and Use of Risk Estimation* to Guide Drug Treatment of Hypertension
I	SBP: A	Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher.
	DBP: C-EO	
I	C-LD	Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-year ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher.

*ACC/AHA Pooled Cohort Equations (http://tools.acc.org/ASCVD-Risk-Estimator/) to estimate 10-year risk of atherosclerotic CVD.

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up (continued on next slide)



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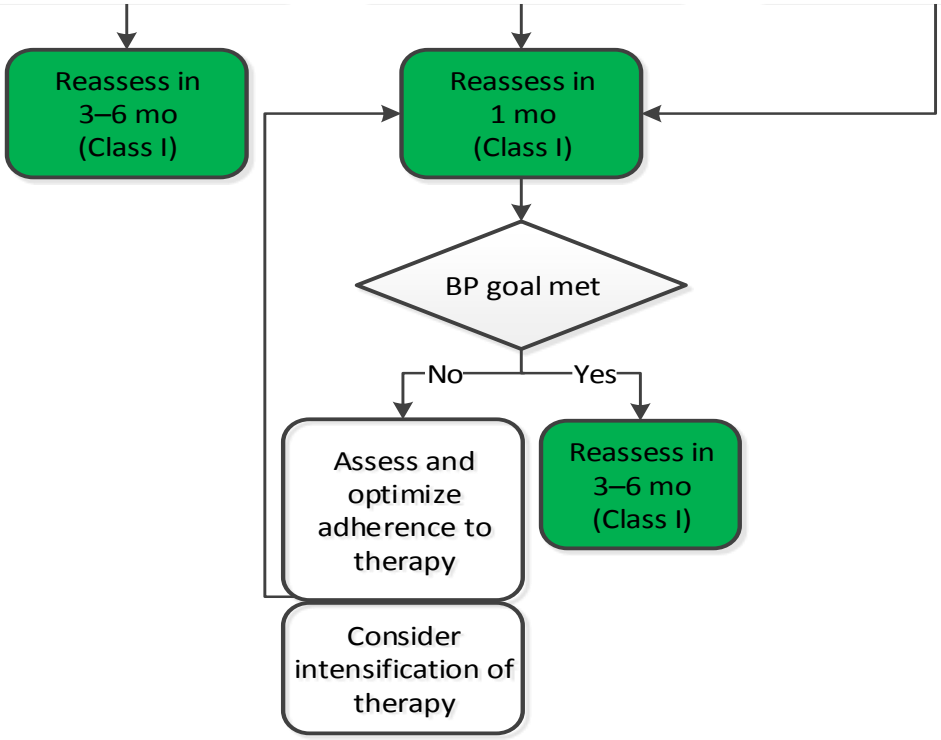


Colors correspond to Class of Recommendation in Table 1.

*Using the ACC/AHA Pooled Cohort Equations. Note that patients with DM or CKD are automatically placed in the high-risk category. For initiation of RAS inhibitor or diuretic therapy, assess blood tests for electrolytes and renal function 2 to 4 weeks after initiating therapy.

†Consider initiation of pharmacological therapy for stage 2 hypertension with 2 antihypertensive agents of different classes. Patients with stage 2 hypertension and BP ≥160/100 mm Hg should be promptly treated, carefully monitored, and subject to upward medication dose adjustment as necessary to control BP. Reassessment includes BP measurement, detection of orthostatic hypotension in selected patients (e.g., older or with postural symptoms), identification of white coat hypertension or a white coat effect, documentation of adherence, monitoring of the response to therapy, reinforcement of the importance of adherence, reinforcement of the importance of treatment, and assistance with treatment to achieve BP target.

Follow-Up After Initial BP Evaluation

COR	LOE	Recommendations for Follow-Up After Initial BP Elevation
I	B-R	Adults with an elevated BP or stage 1 hypertension who have an estimated 10-year ASCVD risk less than 10% should be managed with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 months.
I	B-R	Adults with stage 1 hypertension who have an estimated 10-year ASCVD risk of 10% or higher should be managed initially with a combination of nonpharmacological and antihypertensive drug therapy and have a repeat BP evaluation in 1 month.
I	B-R	Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month.

Follow-Up After Initial BP Evaluation (cont.)

COR	LOE	Recommendations for Follow-Up After Initial BP Elevation
I	B-R	For adults with a very high average BP (e.g., SBP ≥180 mm Hg or DBP ≥110 mm Hg), evaluation followed by prompt antihypertensive drug treatment is recommended.
IIa	C-EO	For adults with a normal BP, repeat evaluation every year is reasonable.

General Principles of Drug Therapy

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

BP Goal for Patients With Hypertension

COR	LOE	Recommendations for BP Goal for Patients With Hypertension
I	SBP: B-R^{SR}	For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher a BP target of less than 130/80 mm Hg is recommended.
	DBP: C-EO	
IIb	SBP: B-NR	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.
	DBP: C-EO	

SR indicates systematic review.

Choice of Initial Medication

COR	LOE	Recommendation for Choice of Initial Medication
I	A^{SR}	For initiation of antihypertensive drug therapy, first-line agents include thiazide diuretics, CCBs, and ACE inhibitors or ARBs.

SR indicates systematic review.

Choice of Initial Monotherapy Versus Initial Combination Drug Therapy

COR	LOE	Recommendations for Choice of Initial Monotherapy Versus Initial Combination Drug Therapy*
I	C-EO	Initiation of antihypertensive drug therapy with 2 first-line agents of different classes, either as separate agents or in a fixed-dose combination, is recommended in adults with stage 2 hypertension and an average BP more than 20/10 mm Hg above their BP target.
IIa	C-EO	Initiation of antihypertensive drug therapy with a single antihypertensive drug is reasonable in adults with stage 1 hypertension and BP goal <130/80 mm Hg with dosage titration and sequential addition of other agents to achieve the BP target.

Follow-Up After Initiating Antihypertensive Drug Therapy

COR	LOE	Recommendation for Follow-Up After Initiating Antihypertensive Drug Therapy
I	B-R	Adults initiating a new or adjusted drug regimen for hypertension should have a follow-up evaluation of adherence and response to treatment at monthly intervals until control is achieved.

Monitoring Strategies to Improve Control of BP in Patients on Drug Therapy for High BP

COR	LOE	Recommendation for Monitoring Strategies to Improve Control of BP in Patients on Drug Therapy for High BP
I	A	Follow-up and monitoring after initiation of drug therapy for hypertension control should include systematic strategies to help improve BP, including use of HBPM, team-based care, and telehealth strategies.

Hypertension in Patients With Comorbidities

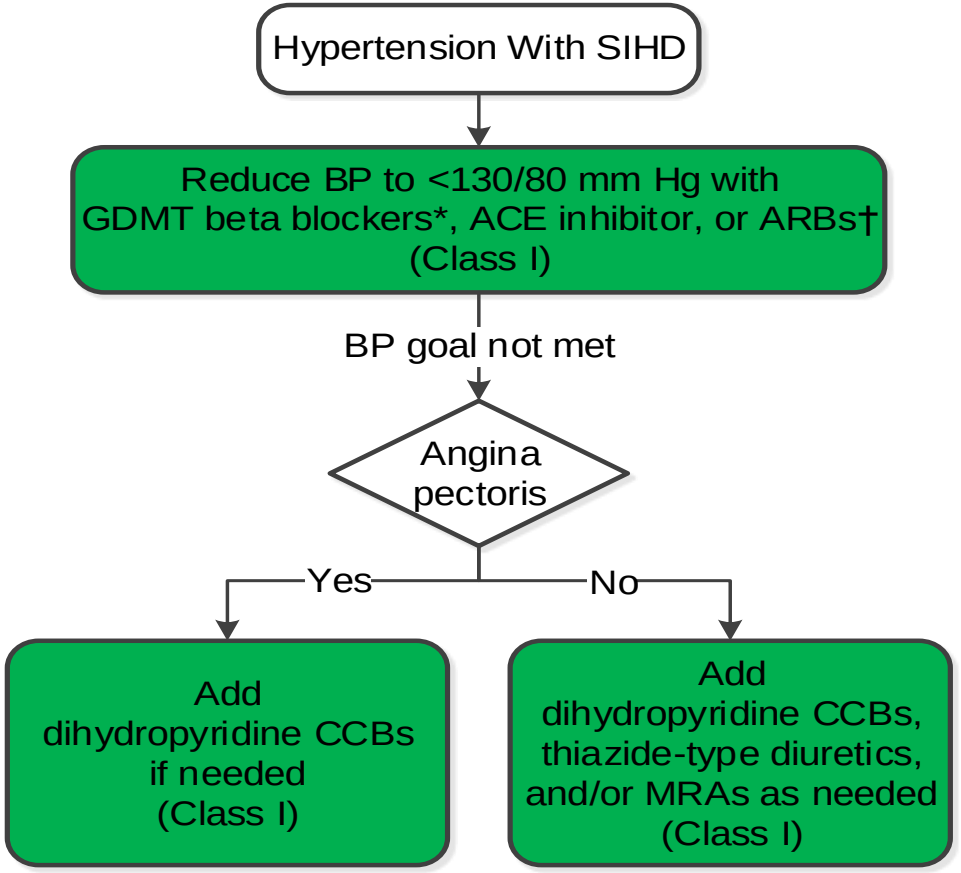
Stable Ischemic Heart Disease

COR	LOE	Recommendations for Treatment of Hypertension in Patients With Stable Ischemic Heart Disease (SIHD)
I	SBP: B-R	In adults with SIHD and hypertension, a BP target of less than 130/80 mm Hg is recommended.
	DBP: C-EO	
I	SBP: B-R	Adults with SIHD and hypertension (BP ≥130/80 mm Hg) should be treated with medications (e.g., GDMT beta blockers, ACE inhibitors, or ARBs) for compelling indications (e.g., previous MI, stable angina) as first-line therapy, with the addition of other drugs (e.g., dihydropyridine CCBs, thiazide diuretics, and/or mineralocorticoid receptor antagonists) as needed to further control hypertension.
	DBP: C-EO	

Stable Ischemic Heart Disease (cont.)

COR	LOE	Recommendations for Treatment of Hypertension in Patients With Stable Ischemic Heart Disease (SIHD)
I	B-NR	In adults with SIHD with angina and persistent uncontrolled hypertension, the addition of dihydropyridine CCBs to GDMT beta blockers is recommended.
IIa	B-NR	In adults who have had a MI or acute coronary syndrome, it is reasonable to continue GDMT beta blockers beyond 3 years as long-term therapy for hypertension.
IIb	C-EO	Beta blockers and/or CCBs might be considered to control hypertension in patients with CAD (without HF*r*EF) who had an MI more than 3 years ago and have angina.

Management of Hypertension in Patients With SIHD



Colors correspond to Class of Recommendation in Table 1.

*GDMT beta blockers for BP control or relief of angina include carvedilol, metoprolol tartrate, metoprolol succinate, nadolol, bisoprolol, propranolol, and timolol. Avoid beta blockers with intrinsic sympathomimetic activity. The beta blocker atenolol should not be used because it is less effective than placebo in reducing cardiovascular events.

†If needed for BP control.

•ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; CCB, calcium channel blocker; GDMT, guideline-directed management and therapy; and SIHD, stable ischemic heart disease.

Heart Failure

COR	LOE	Recommendation for Prevention of HF in Adults With Hypertension
I	SBP: B-R	In adults at increased risk of HF, the optimal BP in those with hypertension should be less than 130/80 mm Hg.
	DBP: C-EO	

Heart Failure With Reduced Ejection Fraction

COR	LOE	Recommendations for Treatment of Hypertension in Patients With HF*r*EF
I	C-EO	Adults with HF*r*EF and hypertension should be prescribed GDMT titrated to attain a BP of less than 130/80 mm Hg.
III: No Benefit	B-R	Nondihydropyridine CCBs are not recommended in the treatment of hypertension in adults with HF*r*EF.

Heart Failure With Preserved Ejection Fraction

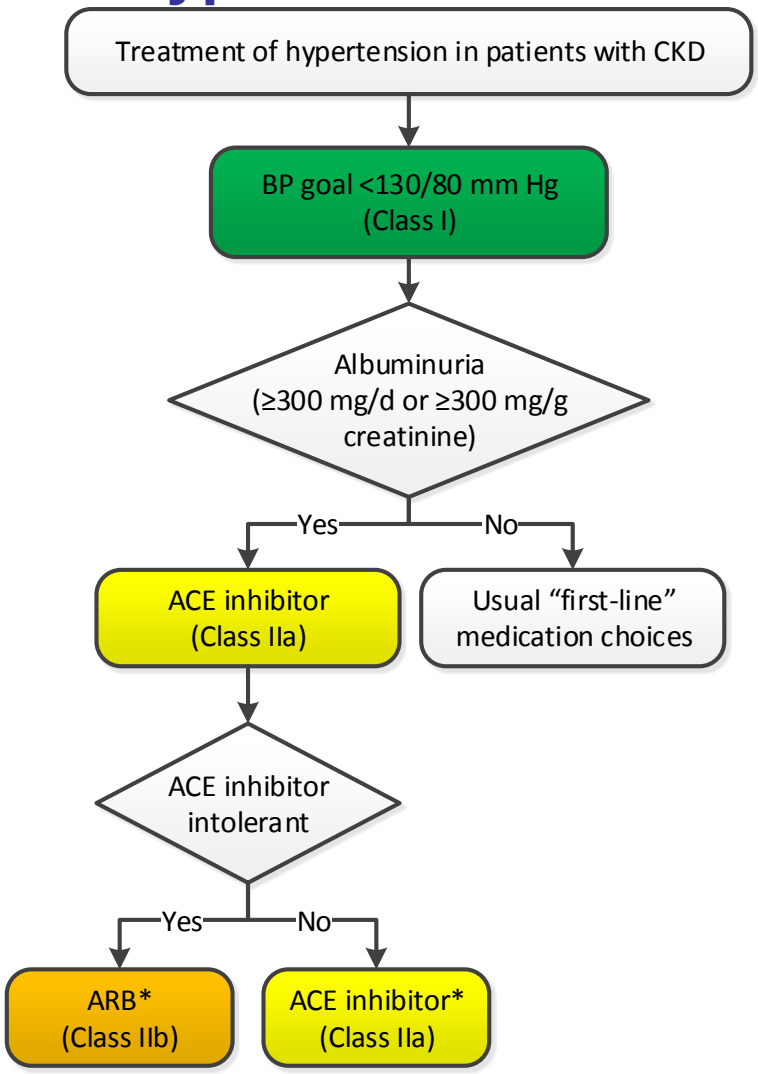
COR	LOE	Recommendations for Treatment of Hypertension in Patients With HF*p*EF
I	C-EO	In adults with HF*p*EF who present with symptoms of volume overload, diuretics should be prescribed to control hypertension.
I	C-LD	Adults with HF*p*EF and persistent hypertension after management of volume overload should be prescribed ACE inhibitors or ARBs and beta blockers titrated to attain SBP of less than 130 mm Hg.

Chronic Kidney Disease

COR	LOE	Recommendations for Treatment of Hypertension in Patients With CKD
I	SBP: B-R[SR]	Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg.
	DBP: C-EO	
IIa	B-R	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.
IIb	C-EO	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.

SR indicates systematic review.

Management of Hypertension in Patients With CKD



•Colors correspond to Class of Recommendation in Table 1.

•*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.

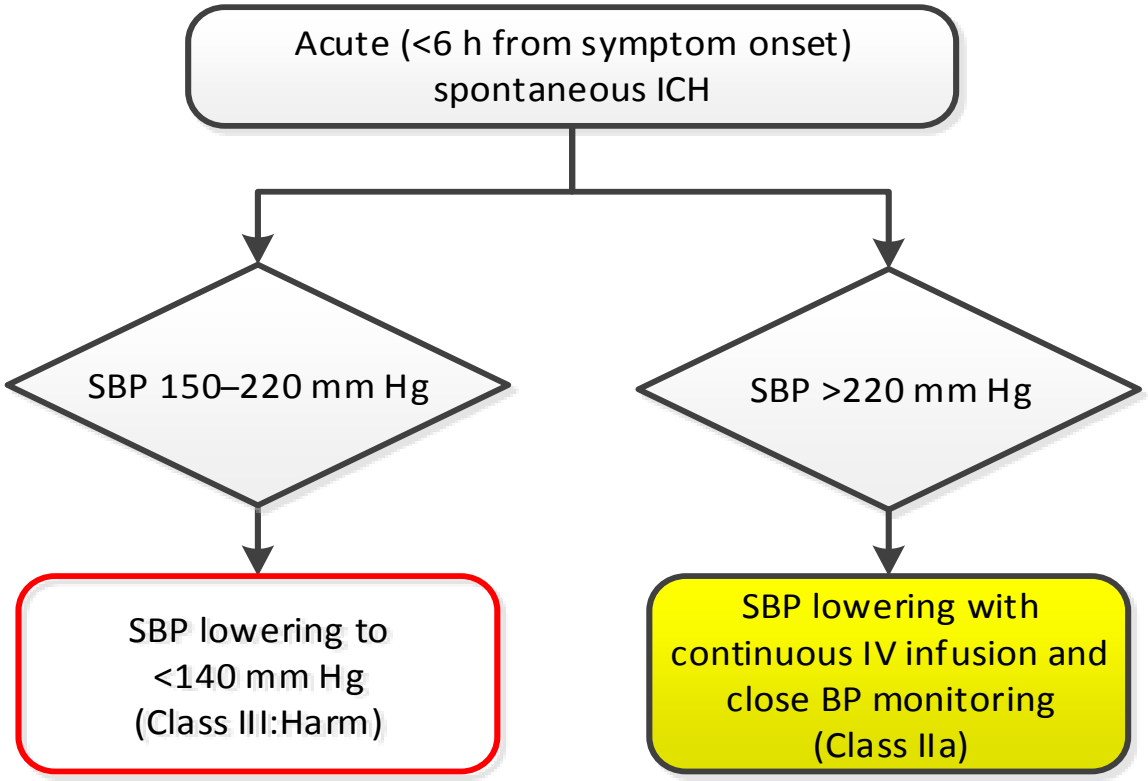
Hypertension After Renal Transplantation

COR	LOE	Recommendations for Treatment of Hypertension After Renal Transplantation
IIa	SBP: B-NR	After kidney transplantation, it is reasonable to treat patients with hypertension to a BP goal of less than 130/80 mm Hg.
	DBP: C-EO	
IIa	B-R	After kidney transplantation, it is reasonable to treat patients with hypertension with a calcium antagonist on the basis of improved GFR and kidney survival.

Acute Intracerebral Hemorrhage

COR	LOE	Recommendations for Management of Hypertension in Patients With Acute Intracerebral Hemorrhage (ICH)
IIa	C-EO	In adults with ICH who present with SBP greater than 220 mm Hg, it is reasonable to use continuous intravenous drug infusion and close BP monitoring to lower SBP.
III: Harm	A	Immediate lowering of SBP to less than 140 mm Hg in adults with spontaneous ICH who present within 6 hours of the acute event and have an SBP between 150 mm Hg and 220 mm Hg is not of benefit to reduce death or severe disability and can be potentially harmful.

Management of Hypertension in Patients With Acute ICH



Colors correspond to Class of Recommendation in Table 1.
BP indicates blood pressure; ICH, intracerebral hemorrhage; IV, intravenous; and SBP, systolic blood pressure.

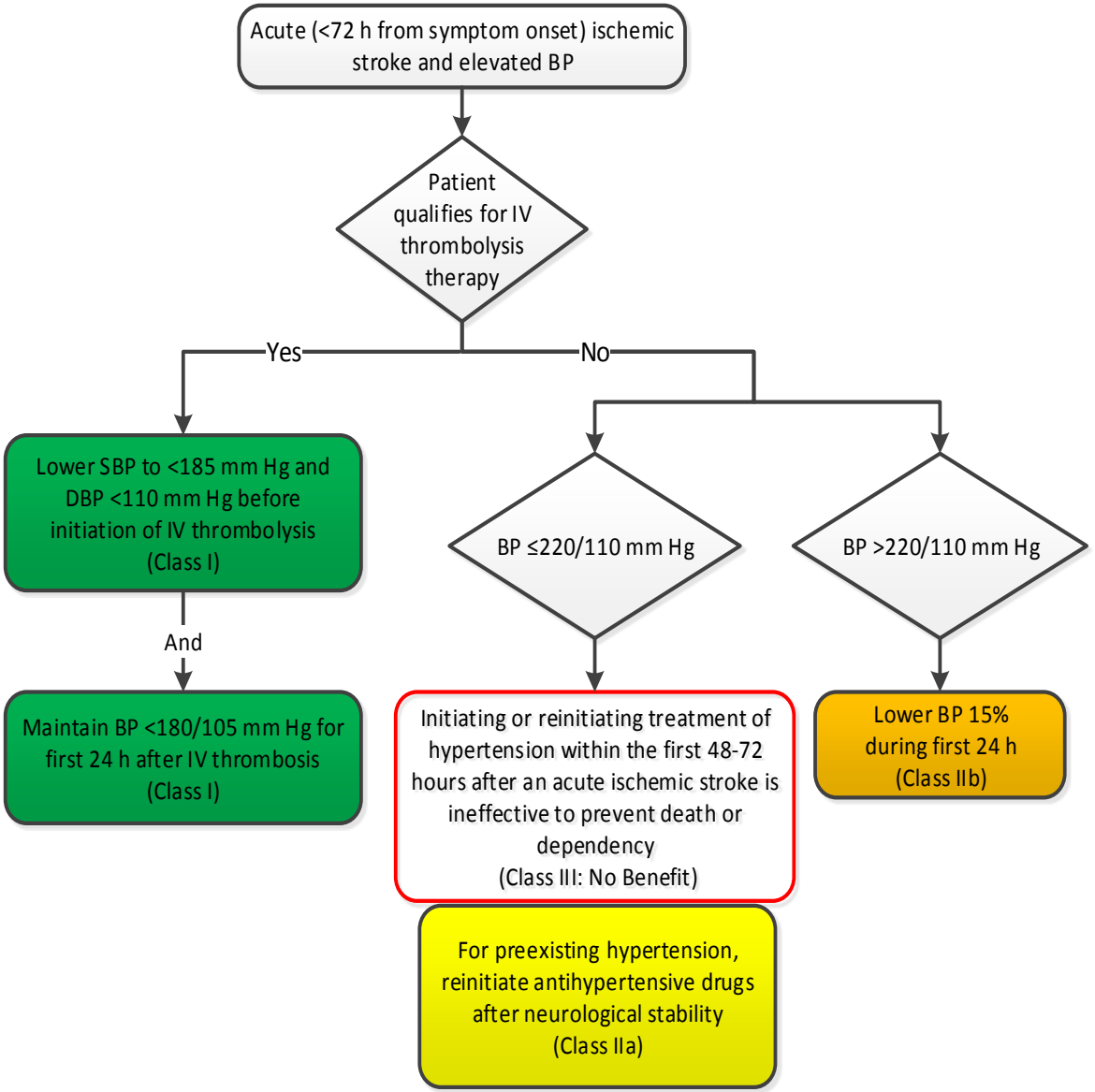
Acute Ischemic Stroke

COR	LOE	Recommendations for Management of Hypertension in Patients With Acute Ischemic Stroke
I	B-NR	Adults with acute ischemic stroke and elevated BP who are eligible for treatment with intravenous tissue plasminogen activator should have their BP slowly lowered to less than 185/110 mm Hg before thrombolytic therapy is initiated.
I	B-NR	In adults with an acute ischemic stroke, BP should be less than 185/110 mm Hg before administration of intravenous tissue plasminogen activator and should be maintained below 180/105 mm Hg for at least the first 24 hours after initiating drug therapy.
IIa	B-NR	Starting or restarting antihypertensive therapy during hospitalization in patients with BP greater than 140/90 mm Hg who are neurologically stable is safe and reasonable to improve long-term BP control, unless contraindicated.

Acute Ischemic Stroke (cont.)

COR	LOE	Recommendations for Management of Hypertension in Patients With Acute Ischemic Stroke
IIb	C-EO	In patients with BP of 220/120 mm Hg or higher who did not receive intravenous alteplase or endovascular treatment and have no comorbid conditions requiring acute antihypertensive treatment, the benefit of initiating or reinitiating treatment of hypertension within the first 48 to 72 hours is uncertain. It might be reasonable to lower BP by 15% during the first 24 hours after onset of stroke.
III: No Benefit	A	In patients with BP less than 220/120 mm Hg who did not receive intravenous thrombolysis or endovascular treatment and do not have a comorbid condition requiring acute antihypertensive treatment, initiating or reinitiating treatment of hypertension within the first 48 to 72 hours after an acute ischemic stroke is not effective to prevent death or dependency.

Management of Hypertension in Patients With Acute Ischemic Stroke



Colors correspond to Class of Recommendation in Table 1.
BP indicates blood pressure; DBP, diastolic blood pressure; IV, intravenous; and SBP, systolic blood pressure.

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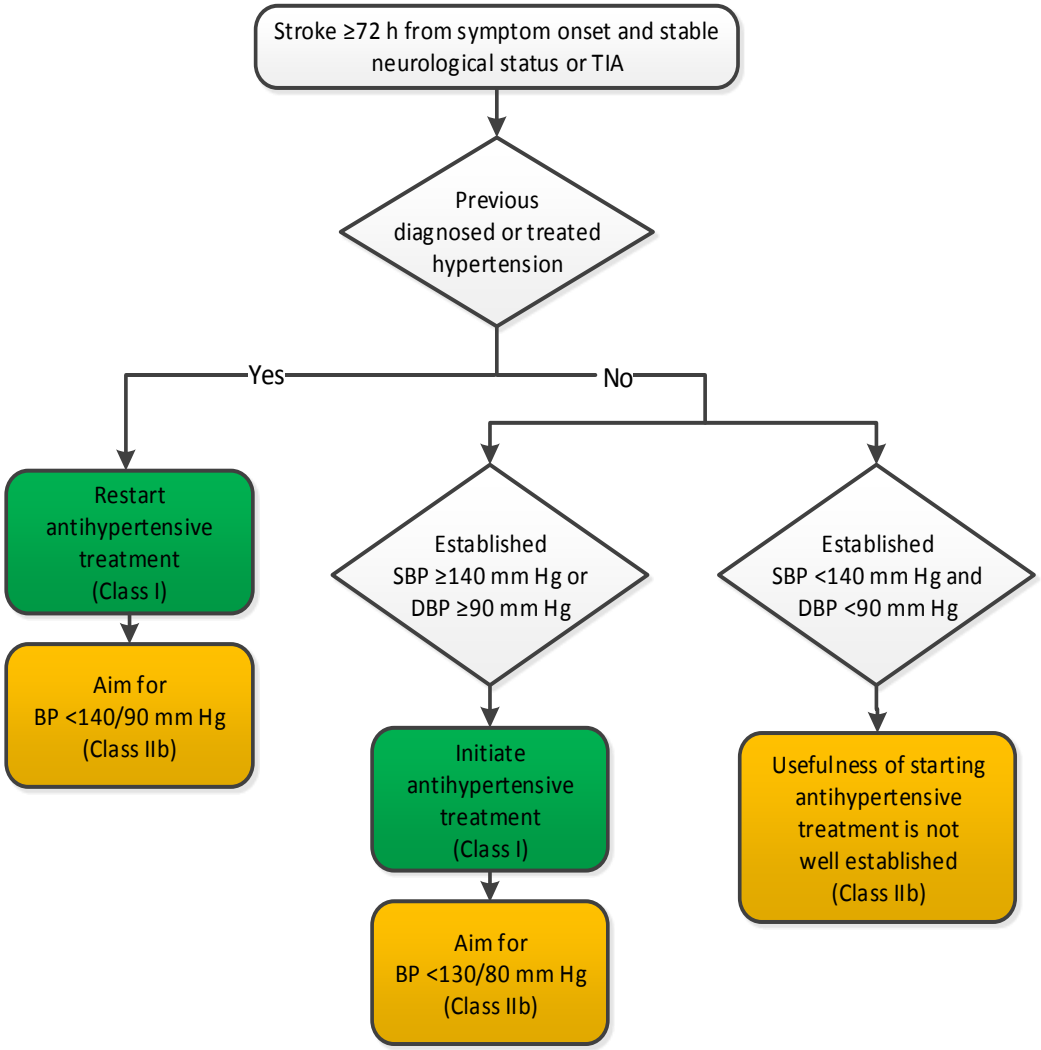
Secondary Stroke Prevention

COR	LOE	Recommendations for Treatment of Hypertension for Secondary Stroke Prevention
I	A	Adults with previously treated hypertension who experience a stroke or transient ischemic attack (TIA) should be restarted on antihypertensive treatment after the first few days of the index event to reduce the risk of recurrent stroke and other vascular events.
I	A	For adults who experience a stroke or TIA, treatment with a thiazide diuretic, ACE inhibitor, or ARB, or combination treatment consisting of a thiazide diuretic plus ACE inhibitor, is useful.
I	B-R	Adults not previously treated for hypertension who experience a stroke or TIA and have an established BP of 140/90 mm Hg or higher should be prescribed antihypertensive treatment a few days after the index event to reduce the risk of recurrent stroke and other vascular events.

Secondary Stroke Prevention (cont.)

COR	LOE	Recommendations for Treatment of Hypertension for Secondary Stroke Prevention
I	B-NR	For adults who experience a stroke or TIA, selection of specific drugs should be individualized on the basis of patient comorbidities and agent pharmacological class.
IIb	B-R	For adults who experience a stroke or TIA, a BP goal of less than 130/80 mm Hg may be reasonable.
IIb	B-R	For adults with a lacunar stroke, a target SBP goal of less than 130 mm Hg may be reasonable.
IIb	C-LD	In adults previously untreated for hypertension who experience an ischemic stroke or TIA and have a SBP less than 140 mm Hg and a DBP less than 90 mm Hg, the usefulness of initiating antihypertensive treatment is not well established.

Management of Hypertension in Patients With a Previous History of Stroke (Secondary Stroke Prevention)



Colors correspond to Class of Recommendation in Table 1.
DBP indicates diastolic blood pressure; SBP, systolic blood pressure; and TIA, transient ischemic attack.

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Peripheral Arterial Disease

COR	LOE	Recommendation for Treatment of Hypertension in Patients With PAD
I	B-NR	Adults with hypertension and PAD should be treated similarly to patients with hypertension without PAD.

Diabetes Mellitus

COR	LOE	Recommendations for Treatment of Hypertension in Patients With DM
I	SBP: B-R[SR] DBP: C-EO	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.
I	A[SR]	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.
IIb	B-NR	In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria.

SR indicates systematic review.

Atrial Fibrillation

COR	LOE	Recommendation for Treatment of Hypertension in Patients With AF
IIa	B-R	Treatment of hypertension with an ARB can be useful for prevention of recurrence of AF.

Valvular Heart Disease

COR	LOE	Recommendations for Treatment of Hypertension in Patients With Valvular Heart Disease
I	B-NR	In adults with asymptomatic aortic stenosis, hypertension should be treated with pharmacotherapy, starting at a low dose and gradually titrating upward as needed.
IIa	C-LD	In patients with chronic aortic insufficiency, treatment of systolic hypertension with agents that do not slow the heart rate (i.e., avoid beta blockers) is reasonable.

Aortic Disease

COR	LOE	Recommendation for Management of Hypertension in Patients With Aortic Disease
I	C-EO	Beta blockers are recommended as the preferred antihypertensive agents in patients with hypertension and thoracic aortic disease.

Special Patient Groups

Racial and Ethnic Differences in Treatment

COR	LOE	Recommendations for Race and Ethnicity
I	B-R	In black adults with hypertension but without HF or CKD, including those with DM, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
I	C-LD	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 with hypertension.

Pregnancy

COR	LOE	Recommendations for Treatment of Hypertension in Pregnancy
I	C-LD	Women with hypertension who become pregnant, or are planning to become pregnant, should be transitioned to methyldopa, nifedipine, and/or labetalol during pregnancy.
III: Harm	C-LD	Women with hypertension who become pregnant should not be treated with ACE inhibitors, ARBs, or direct renin inhibitors.

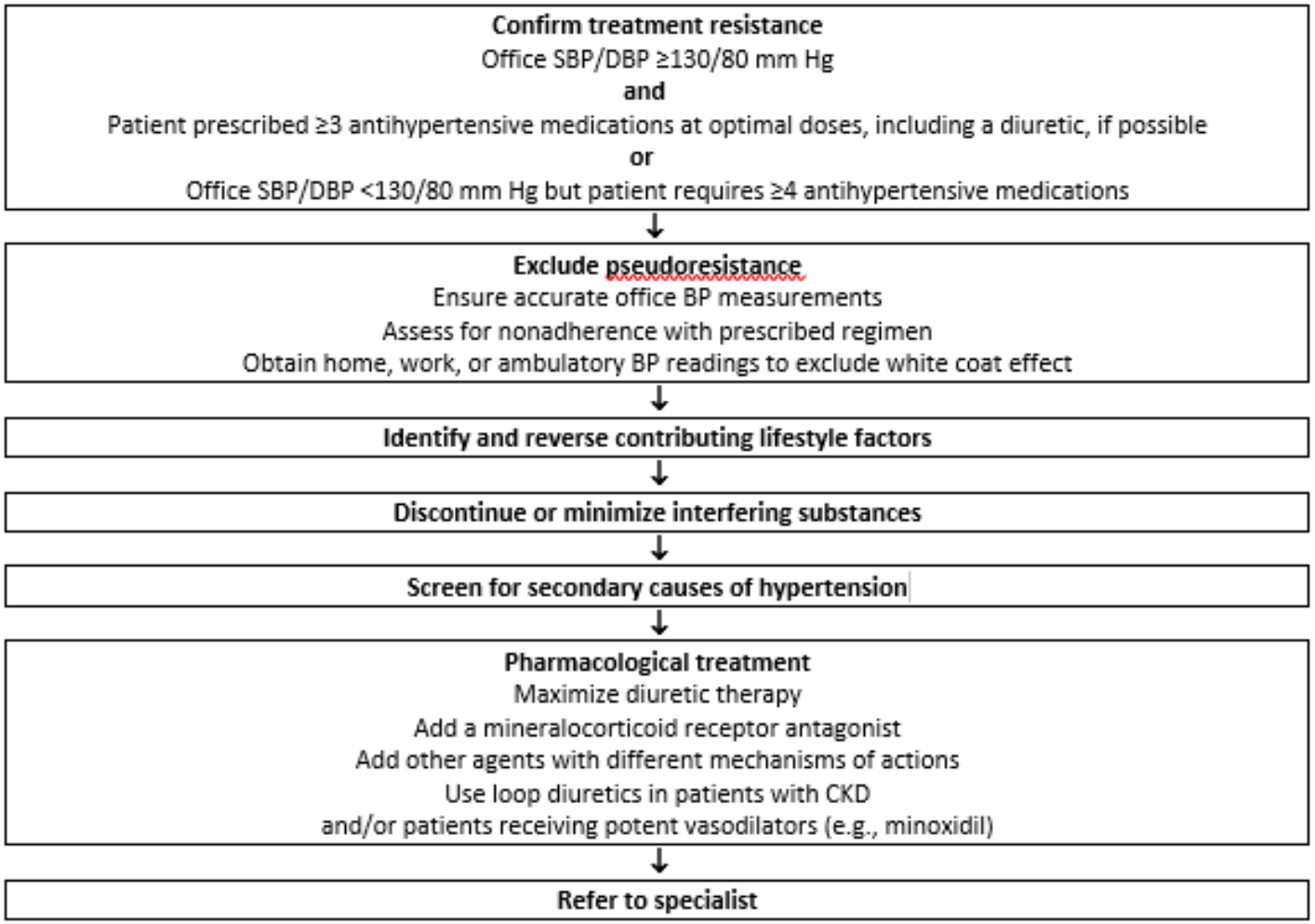
Age-Related Issues

COR	LOE	Recommendations for Treatment of Hypertension in Older Persons
I	A	Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 years of age) with an average SBP of 130 mm Hg or higher.
IIa	C-EO	For older adults (≥65 years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.

Other Considerations

Resistant Hypertension: Diagnosis, Evaluation, and Treatment

Figure 10. Resistant Hypertension: Diagnosis, Evaluation, and Treatment



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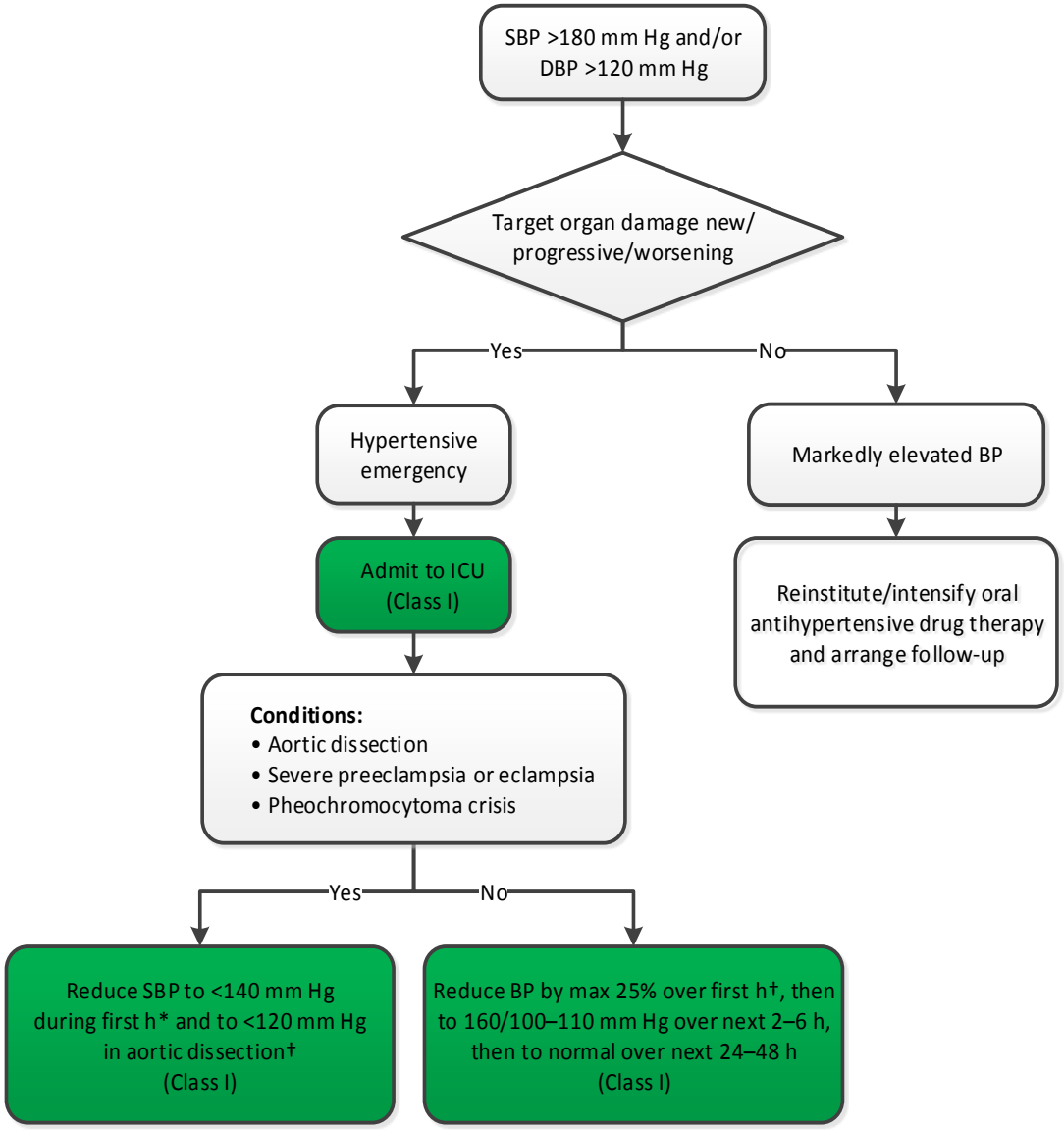
BP indicates blood pressure; CKD, chronic kidney disease; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; NSAIDs, nonsteroidal anti-inflammatory drugs; and SBP, systolic blood pressure.
Adapted with permission from Calhoun et al.

Hypertensive Crises: Emergencies and Urgencies

COR	LOE	Recommendations for Hypertensive Crises and Emergencies
I	B-NR	In adults with a hypertensive emergency, admission to an intensive care unit is recommended for continuous monitoring of BP and target organ damage and for parenteral administration of an appropriate agent.
I	C-EO	For adults with a compelling condition (i.e., aortic dissection, severe preeclampsia or eclampsia, or pheochromocytoma crisis), SBP should be reduced to less than 140 mm Hg during the first hour and to less than 120 mm Hg in aortic dissection.
I	C-EO	For adults without a compelling condition, SBP should be reduced by no more than 25% within the first hour; then, if stable, to 160/100 mm Hg within the next 2 to 6 hours; and then cautiously to normal during the following 24 to 48 hours.

Diagnosis and Management of a Hypertensive Crisis



Colors correspond to Class of Recommendation in Table 1.
*Use drug(s) specified in Table 19.
†If other comorbidities are present, select a drug specified in Table 20.
BP indicates blood pressure; DBP, diastolic blood pressure; ICU, intensive care unit; and SBP, systolic blood pressure.

Cognitive Decline and Dementia

COR	LOE	Recommendation for Prevention of Cognitive Decline and Dementia
IIa	B-R	In adults with hypertension, BP lowering is reasonable to prevent cognitive decline and dementia.

Patients Undergoing Surgical Procedures

COR	LOE	Recommendations for Treatment of Hypertension in Patients Undergoing Surgical Procedures
Preoperative		
I	B-NR	In patients with hypertension undergoing major surgery who have been on beta blockers chronically, beta blockers should be continued.
IIa	C-EO	In patients with hypertension undergoing planned elective major surgery, it is reasonable to continue medical therapy for hypertension until surgery.
IIb	B-NR	In patients with hypertension undergoing major surgery, discontinuation of ACE inhibitors or ARBs perioperatively may be considered.

Patients Undergoing Surgical Procedures (cont.)

COR	LOE	Recommendations for Treatment of Hypertension in Patients Undergoing Surgical Procedures
Preoperative		
IIb	C-LD	In patients with planned elective major surgery and SBP of 180 mm Hg or higher or DBP of 110 mm Hg or higher, deferring surgery may be considered.
III: Harm	B-NR	For patients undergoing surgery, abrupt preoperative discontinuation of beta blockers or clonidine is potentially harmful.
III: Harm	B-NR	Beta blockers should not be started on the day of surgery in beta blocker–naïve patients.
Intraoperative		
I	C-EO	Patients with intraoperative hypertension should be managed with intravenous medications until such time as oral medications can be resumed.

Strategies to Improve Hypertension Treatment and Control

Antihypertensive Medication Adherence Strategies

COR	LOE	Recommendations for Antihypertensive Medication Adherence Strategies
I	B-R	In adults with hypertension, dosing of antihypertensive medication once daily rather than multiple times daily is beneficial to improve adherence.
IIa	B-NR	Use of combination pills rather than free individual components can be useful to improve adherence to antihypertensive therapy.

Strategies to Promote Lifestyle Modification

COR	LOE	Recommendation for Strategies to Promote Lifestyle Modification
I	C-EO	Effective behavioral and motivational strategies to achieve a healthy lifestyle (i.e., tobacco cessation, weight loss, moderation in alcohol intake, increased physical activity, reduced sodium intake, and consumption of a healthy diet) are recommended for adults with hypertension.

Structured, Team-Based Care Interventions for Hypertension Control

COR	LOE	Recommendation for Structured, Team-Based Care Interventions for Hypertension Control
I	A	A team-based care approach is recommended for adults with hypertension.

EHR and Patient Registries

COR	LOE	Recommendations for EHR and Patient Registries
I	B-NR	Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension.
I	B-NR	Use of the EHR and patient registries is beneficial for guiding quality improvement efforts designed to improve hypertension control.

Telehealth Interventions to Improve Hypertension Control

COR	LOE	Recommendation for Telehealth Interventions to Improve Hypertension Control
IIa	A	Telehealth strategies can be useful adjuncts to interventions shown to reduce BP for adults with hypertension.

Performance Measures

COR	LOE	Recommendation for Performance Measures
IIa	**B-NR**	Use of performance measures in combination with other quality improvement strategies at patient-, provider-, and system-based levels is reasonable to facilitate optimal hypertension control.

Quality Improvement Strategies

COR	LOE	Recommendation for Quality Improvement Strategies
IIa	B-NR	Use of quality improvement strategies at the health system, provider, and patient levels to improve identification and control of hypertension can be effective.

Financial Incentives

COR	LOE	Recommendations for Financial Incentives
IIa	**B-R**	Financial incentives paid to providers can be useful in achieving improvements in treatment and management of patient populations with hypertension.
IIa	**B-NR**	Health system financing strategies (e.g., insurance coverage and copayment benefit design) can be useful in facilitating improved medication adherence and BP control in patients with hypertension.

The Plan of Care for Hypertension

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The Plan of Care for Hypertension

COR	LOE	Recommendations for Financial Incentives
I	C-EO	Every adult with hypertension should have a clear, detailed, and current evidence-based plan of care that ensures the achievement of treatment and self-management goals, encourages effective management of comorbid conditions, prompts timely follow-up with the healthcare team, and adheres to CVD GDMT.

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
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.

Summary of BP Thresholds and Goals for Pharmacological Therapy Plan of Care for Hypertension

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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
Chronic kidney disease after renal transplantation	≥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.