

Hypertension

Hanna K. Al-Makhamreh, MD FACC

Associate Professor of Cardiology

University of Jordan



2017 Hypertension Guideline

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 to know if he had nephrotic range proteinuria

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

2017 Hypertension Guideline

Treatment of High BP

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 (130/80-139/89) who have an estimated 10-year ASCVD risk less than 10% should be managed with nonpharmacological therapy (life style) 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. In addition, diabetic patient, >65 Y.O and chronic kidney disease.
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 to achieve the target 130/80) initiated, and have a repeat BP evaluation in 1 month.



Life style changes applies in everybody, but you won't tell to diabetic patient to improve his life style without medications, but in some cases, as an example I prescribed someone medications and he lost 20 kg, I most likely take him off his medications, he will not need them any more.

There's no harm of starting him on the drug till we achieve the goal of blood pressure and then with losing weight we can take off this medications.

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 \geq 180 mm Hg or DBP \geq 110 mm Hg), evaluation followed by prompt antihypertensive drug treatment is recommended.
Ila	C-EO	For adults with a normal BP, repeat evaluation every year is reasonable.

Didn't explain.

BP Goal for Patients With Hypertension

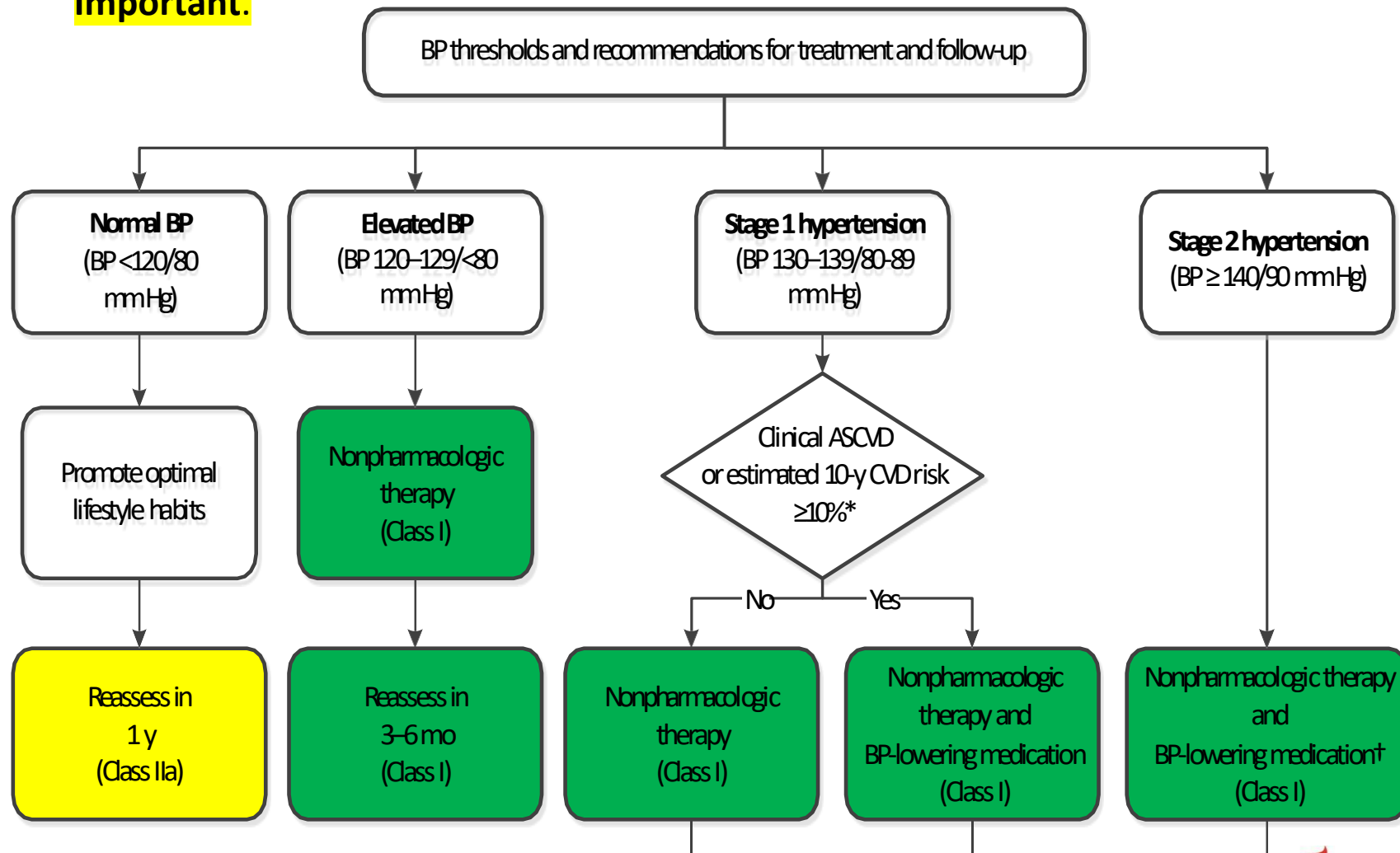
COR	LOE	Recommendations for BP Goal for Patients With Hypertension
I	SBP: B-R ^{SR}	For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher a BP target of less than 130/80 mm Hg is recommended.
	DBP: C-EO	
IIb	SBP: B-NR	For adults with confirmed hypertension,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

Didn't explain.

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up

Important.



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 because both of them maybe cause hyperkalemia and acute kidney injury and is not recommended to treat adults with hypertension.

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.
Ia	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.

Didn't explain.

2017 Hypertension Guideline

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 \geq 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	

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/EF
I	C-EO	Adults with HF/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 as verapamil in the treatment of hypertension in adults with HF/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.

HFrEF → heart failure with reduced Ejection Fraction <40

HFpEF → heart failure with preserved EF >50

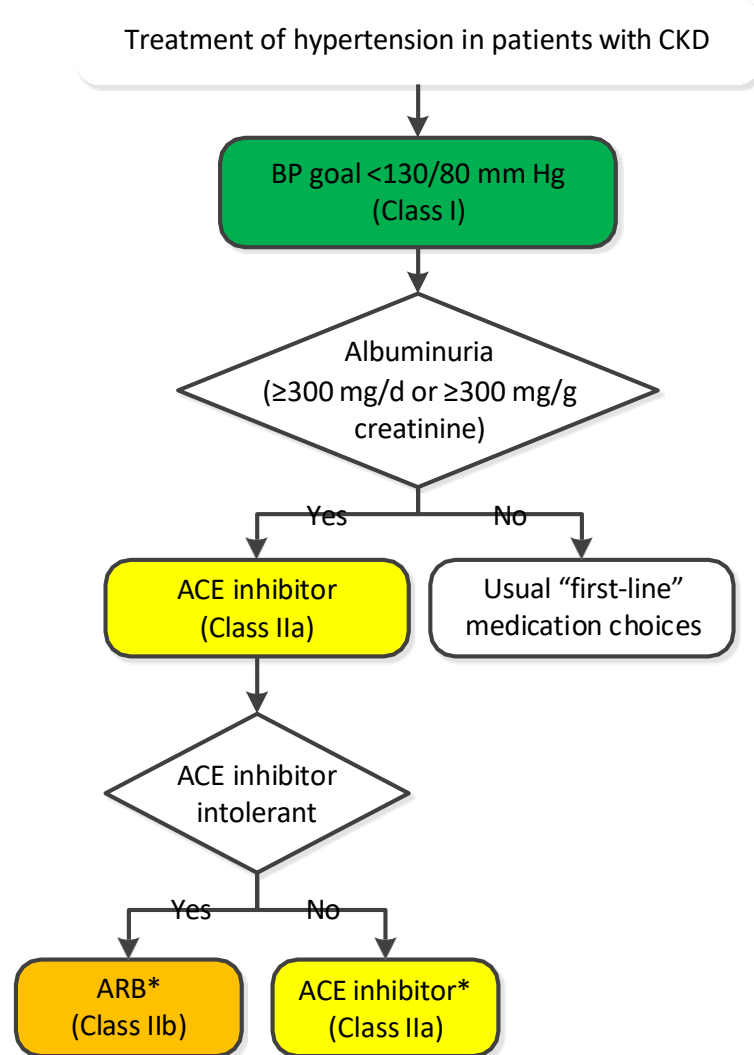
HFmrEF → between 40-50

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 due to the cough.

SR indicates systematic review.

Management of Hypertension in Patients With CKD



Didn't explain.

•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.

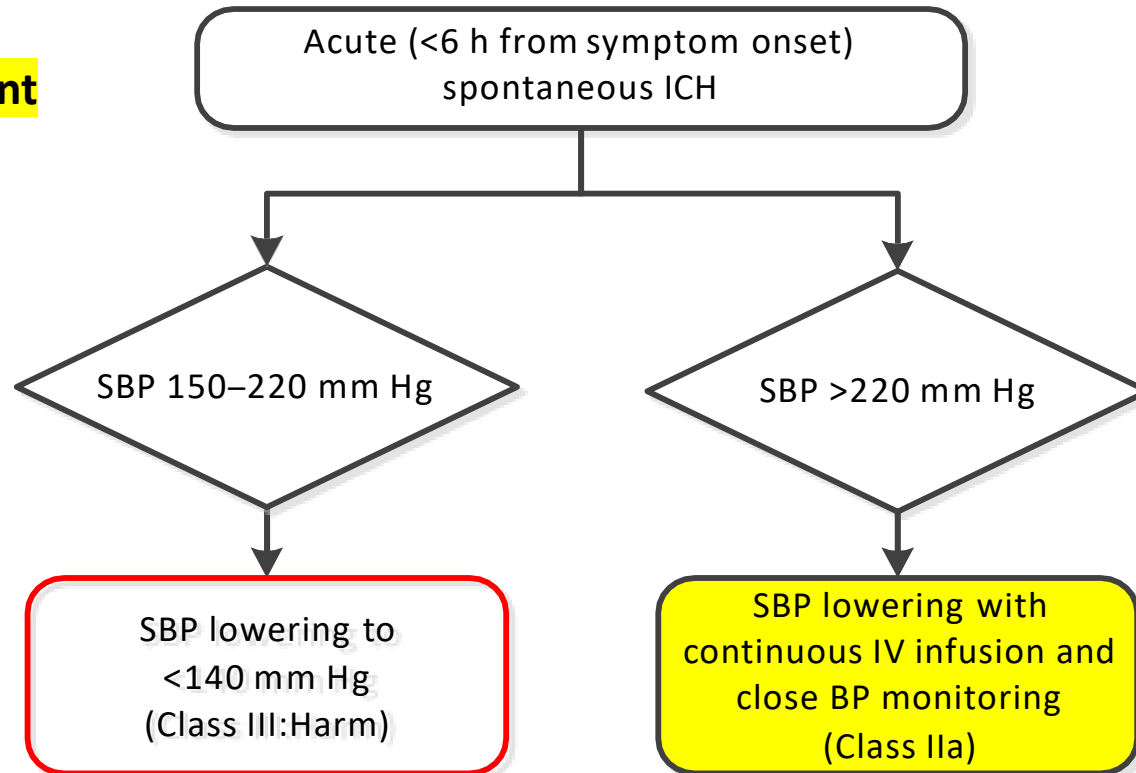
Didn't explain.

Emergency Hypertension

- Hypertension with end organ damage

Management of Hypertension in Patients With Acute ICH

important



We have to calculate to avoid reaching <140 because there's arterial pressure goes to the brain and there's bleeding in the brain which increase intracranial pressure. If there's high lowering, the perfusion of arterial system will be impaired → oligemia and ischemia, so the perfusion pressure has to be maintained in the presence of high intracranial 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.

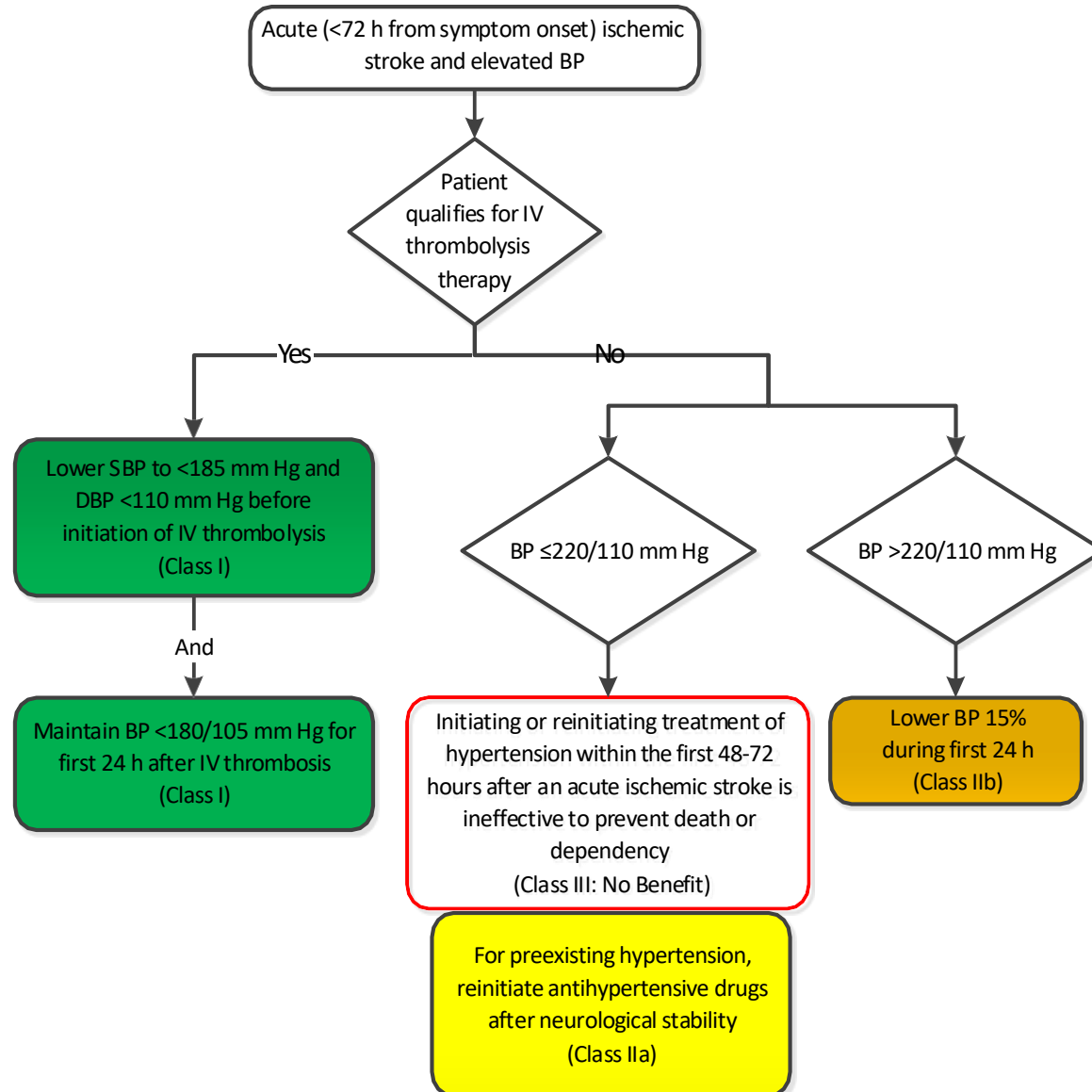
Acute Ischemic Stroke (cont.)

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.

Didn't explain.

Management of Hypertension in Patients With Acute Ischemic Stroke

Important



Colors correspond to Class of Recommendation in Table 1.

BP indicates blood pressure; DBP, diastolic blood pressure; IV, intravenous; and SBP, systolic blood pressure.

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.

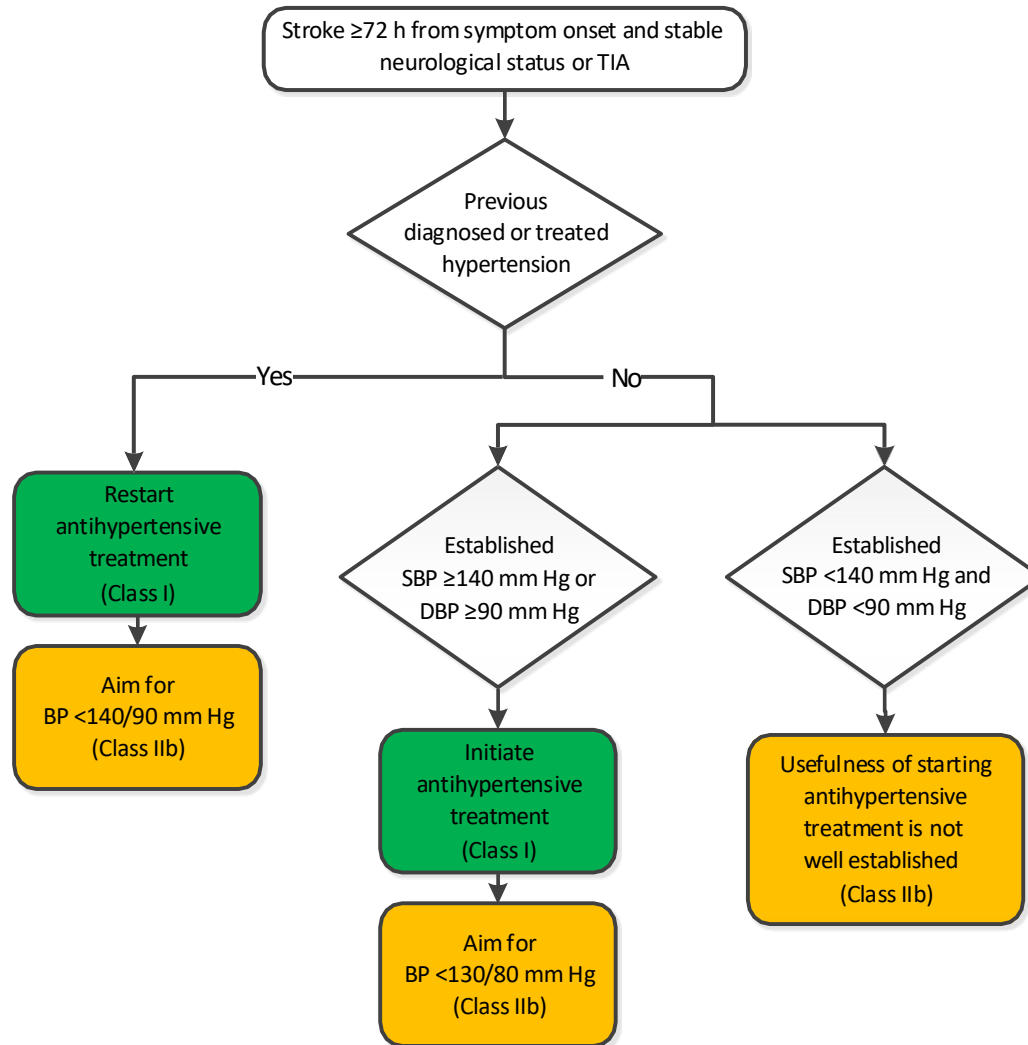
Didn't explain.

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.

Didn't explain.

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



Didn't explain.

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.

Didn't explain.

Diabetes Mellitus

COR	LOE	Recommendations for Treatment of Hypertension in Patients With DM
I	SBP: B-R ^{SR}	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.
	DBP: C-EO	
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.
Ila	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. (decrease ejection force)

2017 Hypertension Guideline

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

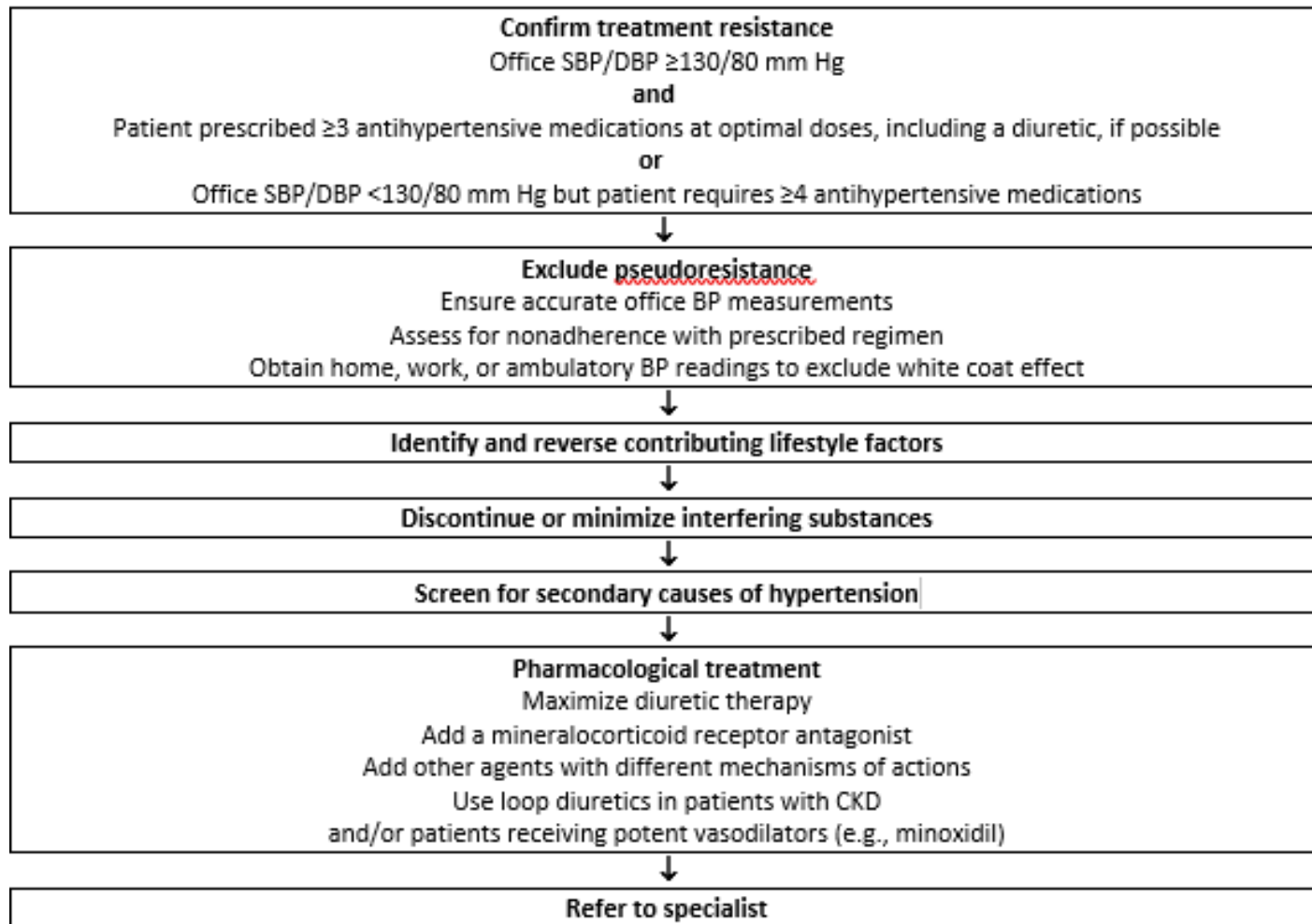
COR	LOE	Recommendations for Treatment of Hypertension in Pregnancy
I	C-LD	Women with hypertension who become pregnant, or are planning to become pregnant, should be transitioned to methyldopa, nifedipine, and/or labetalol during pregnancy.
III: Harm	C-LD	Women with hypertension who become pregnant should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

**Doctor stopped here.
Best of luck.**

Other Considerations

Resistant Hypertension: Diagnosis, Evaluation, and Treatment

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



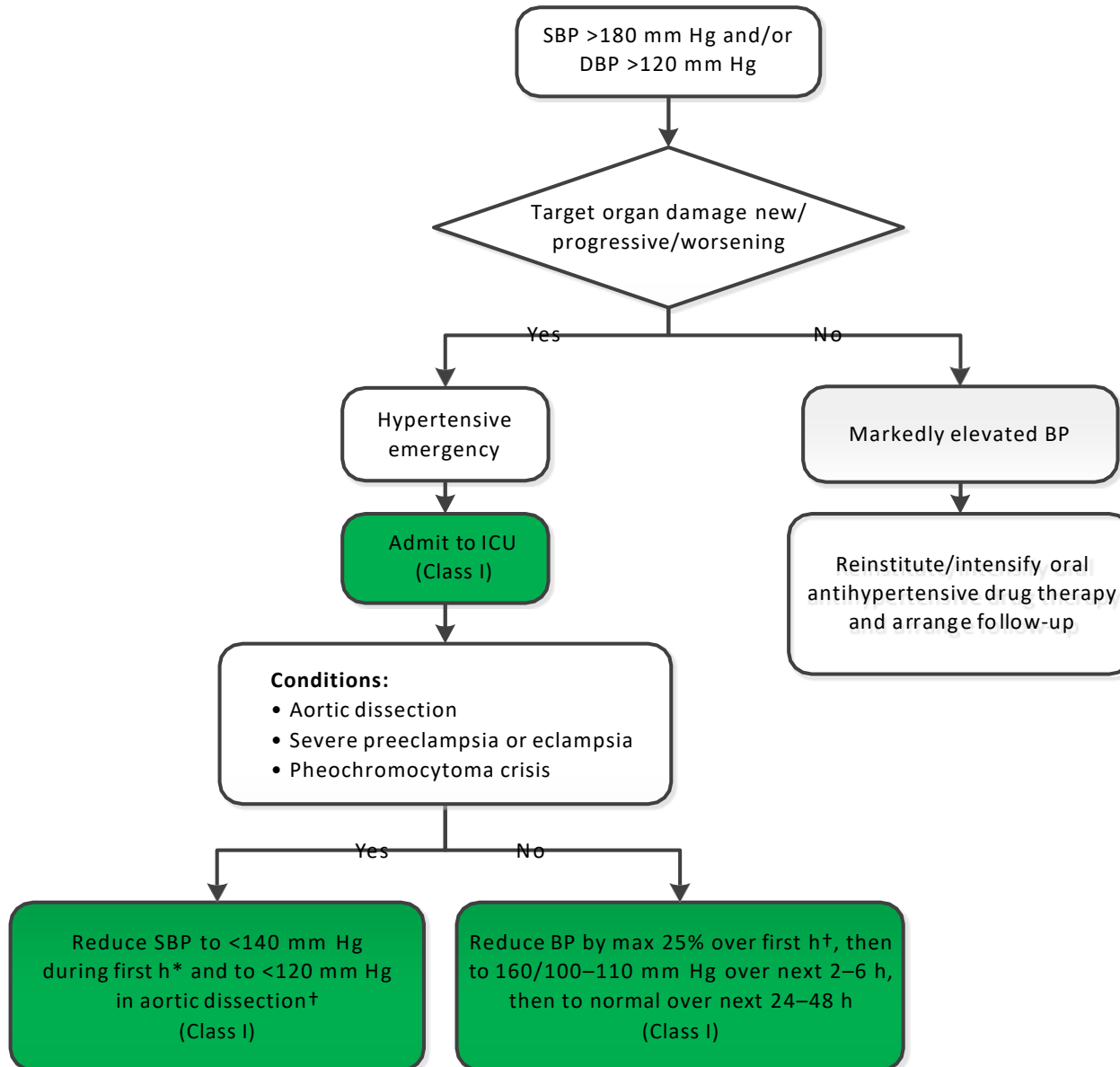
BP indicates blood pressure; CKD, chronic kidney disease; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; NSAIDs, nonsteroidal anti-inflammatory drugs; and SBP, systolic blood pressure.

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



Cognitive Decline and Dementia

COR	LOE	Recommendation for Prevention of Cognitive Decline and Dementia
Ila	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.

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.
Ila	B-NR	Use of combination pills rather than free individual components can be useful to improve adherence to antihypertensive therapy.

2017 Hypertension Guideline

The Plan of Care for Hypertension

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.

2017 Hypertension Guideline

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

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 $\geq 10\%$	$\geq 130/80$	$< 130/80$
No clinical CVD and 10-year ASCVD risk $< 10\%$	$\geq 140/90$	$< 130/80$
Older persons (≥ 65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥ 130 (SBP)	< 130 (SBP)
Specific comorbidities		
Diabetes mellitus	$\geq 130/80$	$< 130/80$
Chronic kidney disease	$\geq 130/80$	$< 130/80$
Chronic kidney disease after renal transplantation	$\geq 130/80$	$< 130/80$
Heart failure	$\geq 130/80$	$< 130/80$
Stable ischemic heart disease	$\geq 130/80$	$< 130/80$
Secondary stroke prevention	$\geq 140/90$	$< 130/80$
Secondary stroke prevention (lacunar)	$\geq 130/80$	$< 130/80$
Peripheral arterial disease	$\geq 130/80$	$< 130/80$

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

Thank You

