

## The National Hypertension Control Initiative (NHCI) Treatment Algorithms are designed to:

### Clinically

- Emphasize evidence-based use of self-measured blood pressure (SMBP) to confirm a diagnosis of hypertension (HTN) and to support treatment intensification.
- Focus on a blood pressure (BP) goal of <130/<80 mm Hg.
- Guide evidence-based treatment intensification, adding classes of medications to maximize BP lowering effects and minimize side effects.
- Prioritize the use of calcium channel blockers (CCBs) and thiazide diuretics as first-line therapy among Black adults.
- Promote the use of single-pill combination (SPC) therapy when indicated to minimize pill burden and improve medication adherence.

### Practically

- Illustrate where/how SMBP can be used in clinical decision-making.
- Demonstrate how follow-up intervals can be managed for rapid evaluation, treatment, and risk reduction.
- Provide “menus” of drug options from which to customize in alignment with local pharmacies and formularies to optimize ease of access and minimize patient cost.
- Offer a tool to integrate into local team-based care models and/or decision-support functionality in the electronic health record.

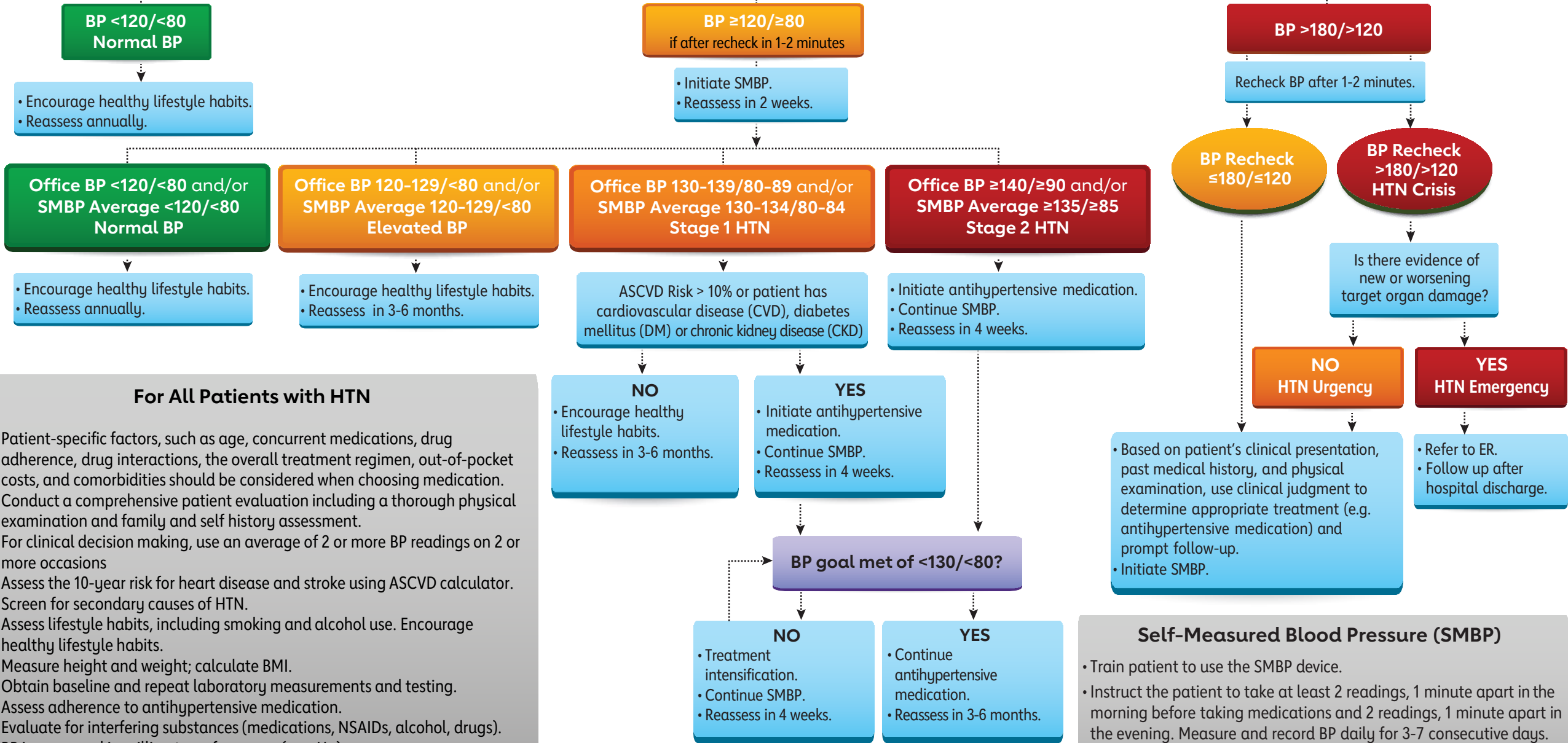


# Blood Pressure (BP) Treatment Algorithm for Patients Without a History of Hypertension (HTN)

(Version 1: Updated 10/20/22)

Initial Office Visit

For SMBP measurement interpretation, an average systolic and diastolic BP of 135/85 mm Hg is considered equivalent to 140/90 mm Hg in the clinical setting.



**For All Patients with HTN**

- Patient-specific factors, such as age, concurrent medications, drug adherence, drug interactions, the overall treatment regimen, out-of-pocket costs, and comorbidities should be considered when choosing medication.
- Conduct a comprehensive patient evaluation including a thorough physical examination and family and self history assessment.
- For clinical decision making, use an average of 2 or more BP readings on 2 or more occasions
- Assess the 10-year risk for heart disease and stroke using ASCVD calculator.
- Screen for secondary causes of HTN.
- Assess lifestyle habits, including smoking and alcohol use. Encourage healthy lifestyle habits.
- Measure height and weight; calculate BMI.
- Obtain baseline and repeat laboratory measurements and testing.
- Assess adherence to antihypertensive medication.
- Evaluate for interfering substances (medications, NSAIDs, alcohol, drugs).
- BP is measured in millimeters of mercury (mm Hg).

**Self-Measured Blood Pressure (SMBP)**

- Train patient to use the SMBP device.
- Instruct the patient to take at least 2 readings, 1 minute apart in the morning before taking medications and 2 readings, 1 minute apart in the evening. Measure and record BP daily for 3-7 consecutive days.
- Ideally, obtain BP readings beginning 2 weeks after a change in treatment regimen and during the week before a follow-up visit.



Office BP  $\geq 140/\geq 90$  and/or SMBP Average  $\geq 135/\geq 85$  Stage 2 HTN

- Initiate antihypertensive medication.
- **First-line agents include CCBs, thiazide diuretics, ACEIs, and ARBs.**
- Consider initiating antihypertensive medication with 2 different medications from 2 different classes.
- **Do not combine ACEI and ARB.**
- Use single pill combinations (SPC) when possible.
- Recommended combinations include:
  - CCB and ACEI or ARB
  - Thiazide diuretic and ACEI or ARB
  - CCB and thiazide diuretic
- Continue SMBP. Reassess in 4 weeks.

BP goal met of  $<130/<80$ ?

YES

- Continue antihypertensive medication.
- Reassess in 3-6 months.

NO

- **Consider adding a medication from a different class or titrating current medication to maximal dose.**
  - If taking CCB and ACEI or ARB, add thiazide diuretic.
  - If taking thiazide diuretic and ACEI or ARB, add CCB.
  - If taking CCB and thiazide diuretic, add ACEI or ARB.
- Continue SMBP. Reassess in 4 weeks.

BP goal met of  $<130/<80$ ?

NO

- **Consider adding spironolactone if already on medications from 3 different classes or titrating current medication to maximal dose.**
- Consider HTN specialist referral.
- Continue SMBP. Reassess in 4 weeks.

BP goal met of  $<130/<80$ ?

NO

- Consider titrating current medication to maximal dose.
- Consult hypertension specialist.

### SMBP versus Office Visit

For SMBP measurement interpretation, an average systolic and diastolic BP of 135/85 mm Hg is considered equivalent to 140/90 mm Hg in the office setting.

### SMBP for Treatment Intensification

- Ideally, obtain BP readings beginning 2 weeks after a change in the treatment regimen and during the week before a follow-up visit.
- Instruct the patient to take at least 2 readings, 1 minute apart in the morning before taking medications and 2 readings, 1 minute apart in the evening. Measure and record BP daily for 3-7 consecutive days.

# Blood Pressure (BP) Treatment Algorithm for Patients With Stage 2 Hypertension (HTN)

## Not on Medication (Version 1: Updated 10/20/2022)

For adults without HF, CKD (including renal transplantation), DM, metabolic syndrome, pregnancy, history of CVA, SIHD, atrial fibrillation, valvular heart disease or aortic disease.

### Medication Considerations

- For patients with average BP readings that are  $>20$  mm Hg systolic or  $>10$  mm Hg diastolic above goal, it is recommended to begin treatment with 2 medications from 2 different classes.
- Initiation of 1 antihypertensive medication is reasonable in older adults or those at risk or who have a history of hypotension or drug-associated side effects.
- **For Black adults with HTN (without HF or CKD), including those with DM, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.**

### For All Patients with HTN

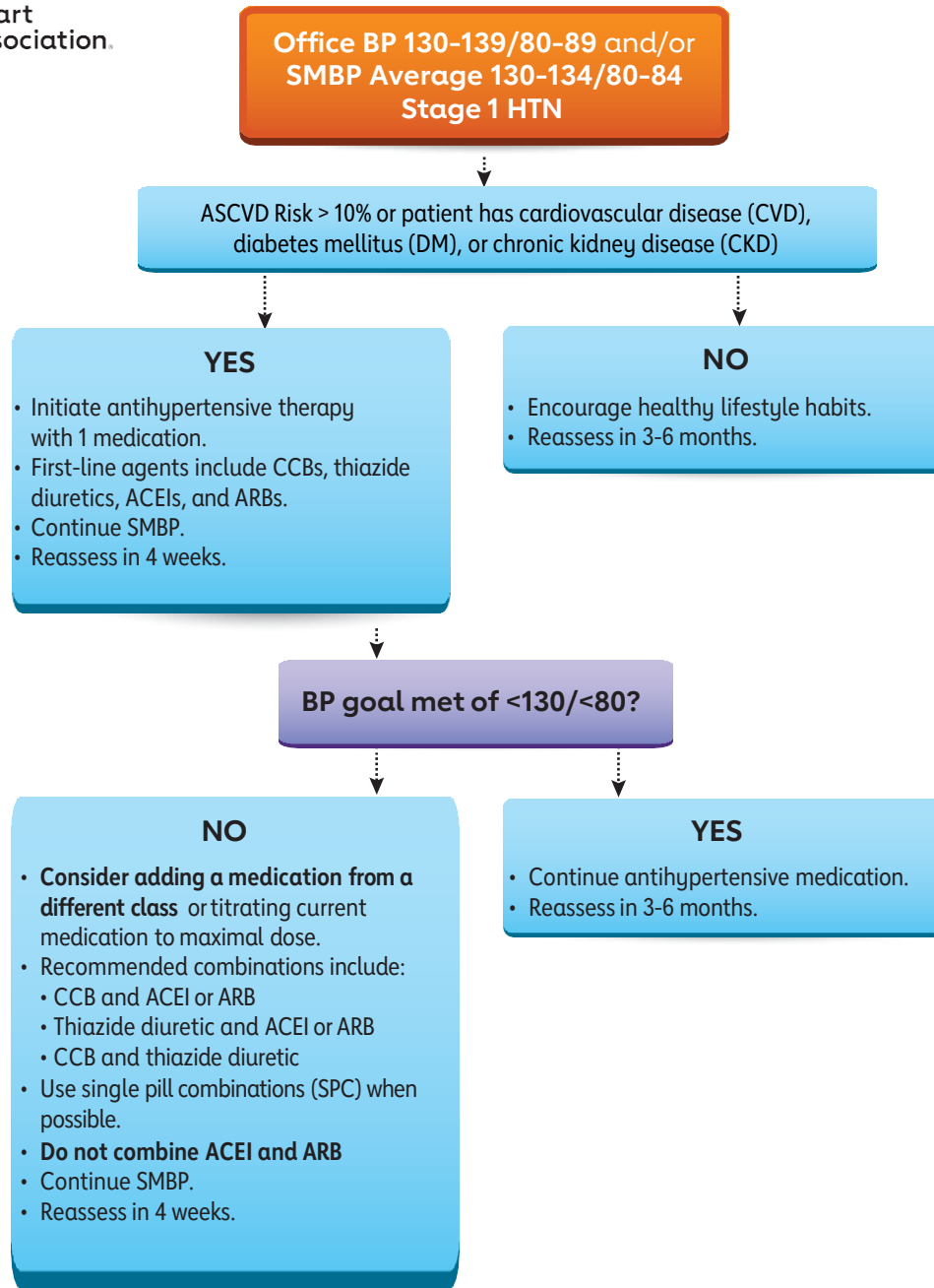
- Patient-specific factors, such as age, concurrent medications, drug adherence, drug interactions, the overall treatment regimen, out-of-pocket costs, and comorbidities, should be considered when choosing medication.
- Conduct a comprehensive patient evaluation including a thorough physical examination and family and self history assessment.
- For clinical decision making, use an average of 2 or more BP readings on 2 or more occasions
- Assess the 10-year risk for heart disease and stroke using ASCVD calculator.
- Screen for secondary causes of HTN.
- Assess lifestyle habits, including smoking and alcohol use. Encourage healthy lifestyle habits.
- Measure height and weight; calculate BMI.
- Assess adherence to antihypertensive medication.
- Obtain baseline and repeat laboratory measurements and testing.
- Evaluate for interfering substances (medications, NSAIDs, alcohol, drugs).
- BP is measured in millimeters of mercury (mm Hg).



# Blood Pressure (BP) Treatment Algorithm for Patients With Stage 1 Hypertension (HTN) Not on Medication

(Version 1: Updated 10/20/22)

For adults without HF, CKD (including renal transplantation), metabolic syndrome, pregnancy, history of CVA, SIHD, atrial fibrillation, valvular heart disease or aortic disease.



## SMBP for Treatment Intensification

- Ideally, obtain BP readings beginning 2 weeks after a change in the treatment regimen and during the week before a follow-up visit.
- Instruct the patient to take at least 2 readings, 1 minute apart in the morning before taking medications and 2 readings, 1 minute apart in the evening. Measure and record BP daily for 3-7 consecutive days.

## SMBP versus Office Visit

For SMBP measurement interpretation, an average systolic and diastolic BP of 135/85 mm Hg is considered equivalent to 140/90 mm Hg in the office setting.

## For All Patients with HTN

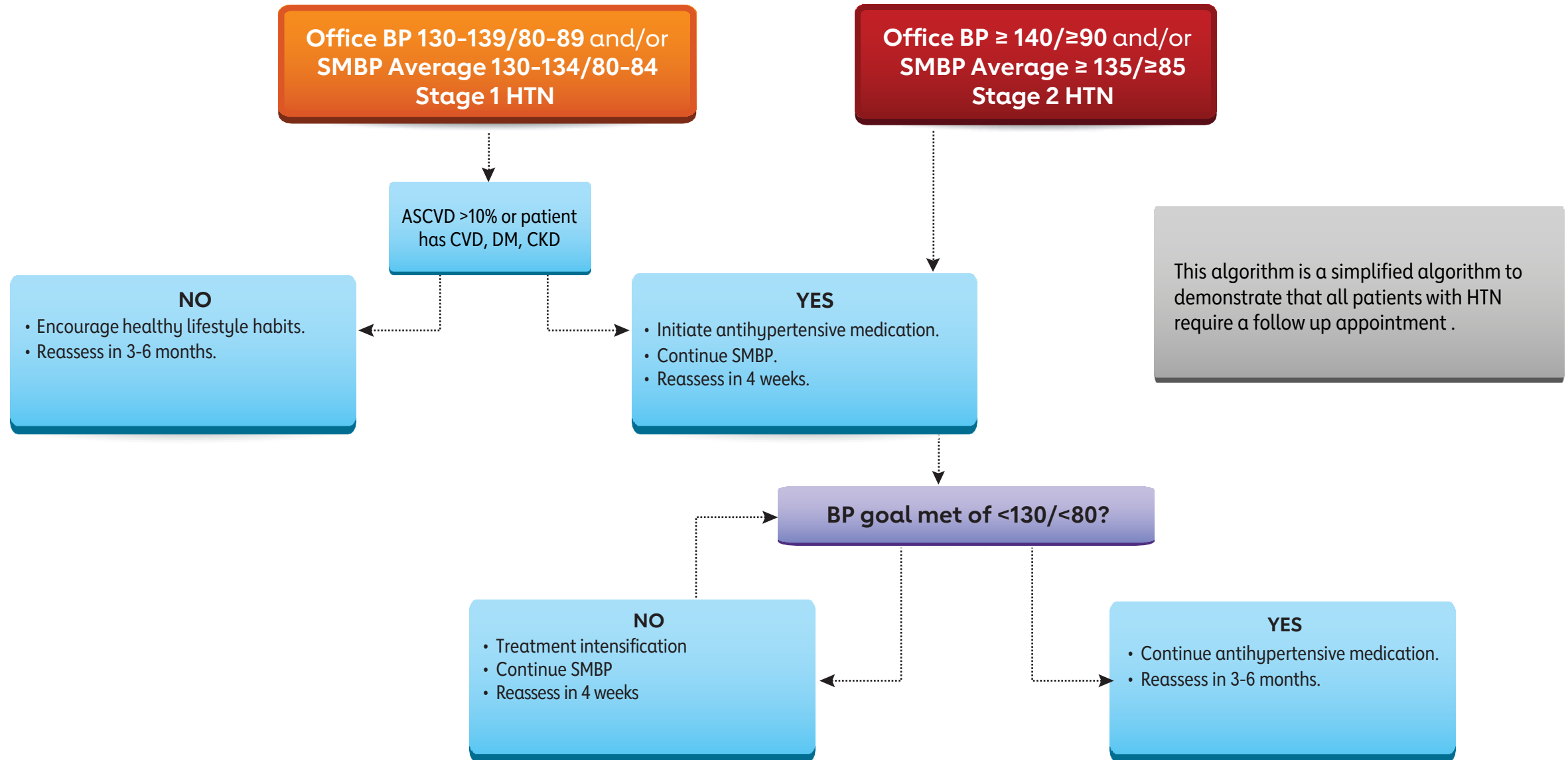
- Patient-specific factors, such as age, concurrent medications, drug adherence, drug interactions, the overall treatment regimen, out-of-pocket costs, and comorbidities should be considered when choosing medication.
- Conduct a comprehensive patient evaluation including a thorough physical examination and family and self history assessment.
- For clinical decision making, use an average of 2 or more BP readings on 2 or more occasions
- Assess the 10-year risk for heart disease and stroke using ASCVD calculator.
- Screen for secondary causes of HTN.
- Assess lifestyle habits, including smoking and alcohol use. Encourage healthy lifestyle habits.
- Measure height and weight; calculate BMI.
- Obtain baseline and repeat laboratory measurements and testing.
- Assess adherence to antihypertensive medication.
- Evaluate for interfering substances (medications, NSAIDs, alcohol, drugs).
- BP is measured in millimeters of mercury (mm Hg).

## Medication Considerations

- **For Black adults with HTN (without HF or CKD), including those with DM, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.**
- In adults with HTN and CKD (stage 3 or higher or stage 1 or 2 with albuminuria [ $\geq 300$  mg/d, or  $\geq 300$  mg/g albumin-to-creatinine ratio or the equivalent in the first morning void]), initial treatment with an ACEI is reasonable to slow kidney disease progression, and treatment with an ARB may be reasonable if an ACEI is not tolerated.

# Blood Pressure (BP) Treatment, at a Glance, for Stage 1 and Stage 2 Hypertension (HTN)

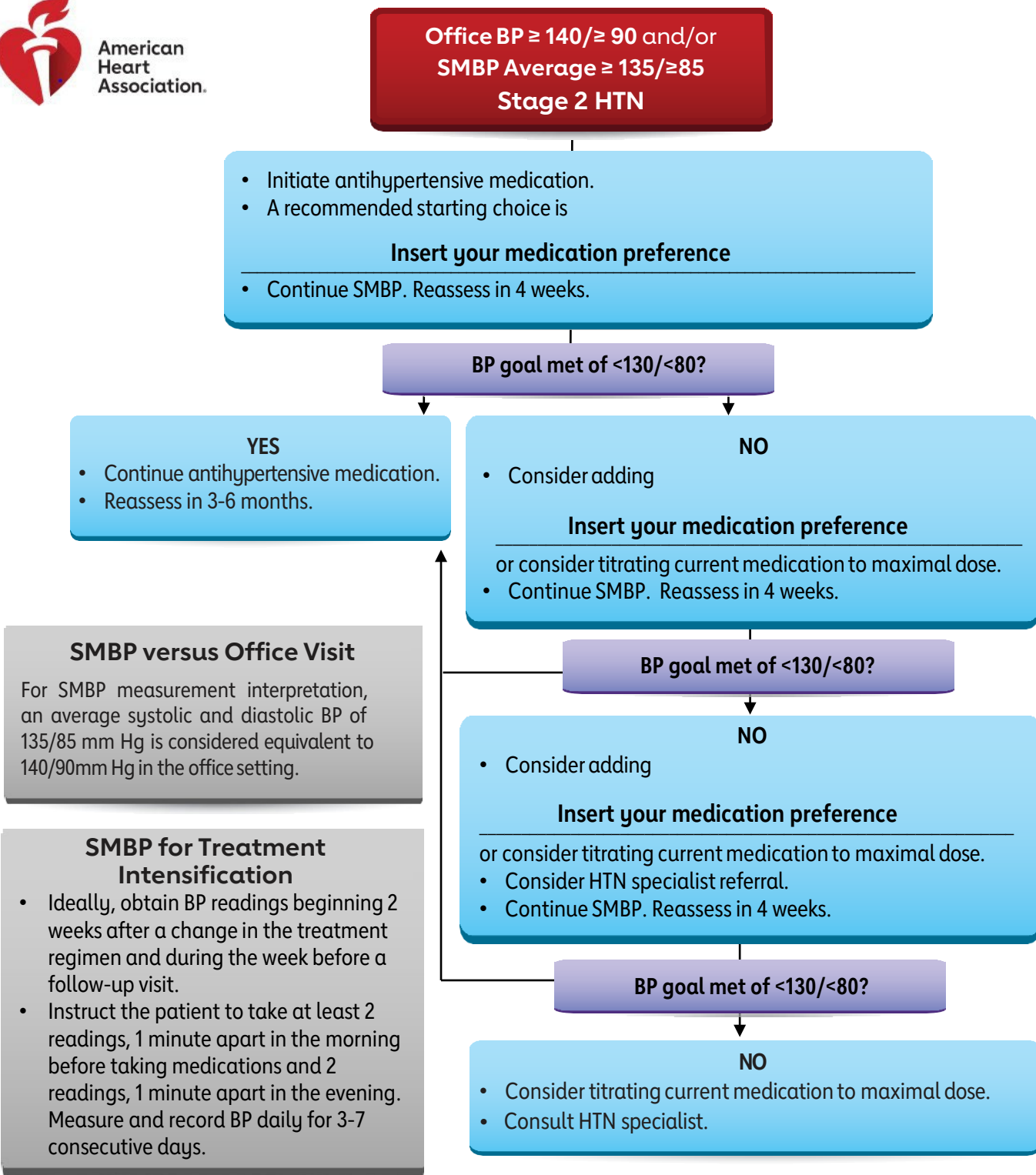
(Version 1: Updated 10/20/2022)



# Customizable Blood Pressure (BP) Treatment Template for Patients with Stage 2 Hypertension (HTN)

## Not on Medication

For adults without HF, CKD (including renal transplantation), DM, metabolic syndrome, pregnancy, history of CVA, SIHD, atrial fibrillation, valvular heart disease or aortic disease.



### Medication Considerations

- For patients with average BP readings that are >20 mm Hg systolic or >10 mm Hg diastolic above goal, it is recommended to begin treatment with 2 medications from 2 different classes.
- Initiation of one antihypertensive medication is reasonable in older adults or those at risk or who have a history of hypotension or drug-associated side effects.

### For All Patients with HTN

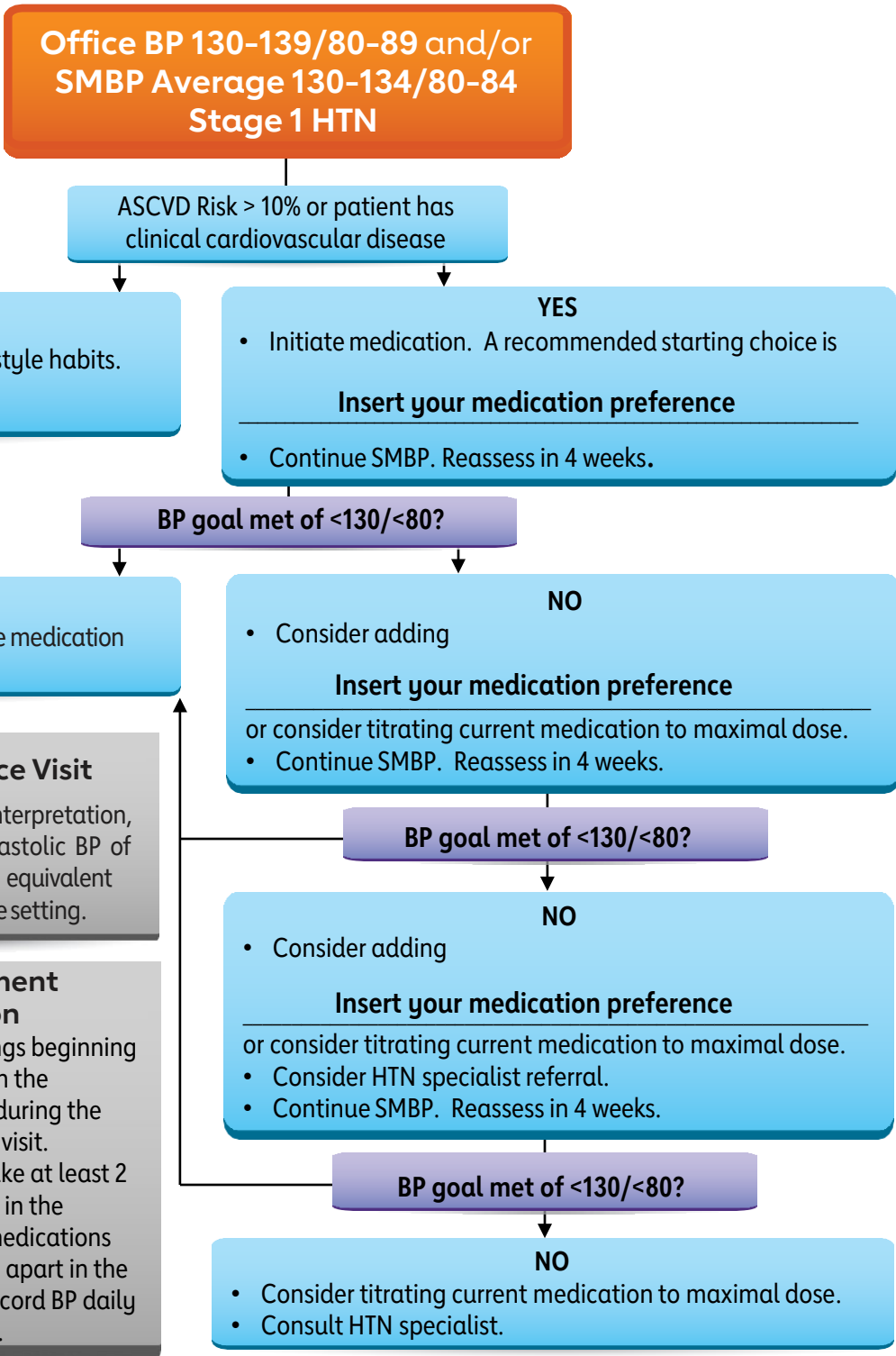
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- Evaluate for interfering substances (medications, NSAIDs, alcohol, drugs).

### SMBP versus Office Visit

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### SMBP for Treatment Intensification

- Ideally, obtain BP readings beginning 2 weeks after a change in the treatment regimen and during the week before a follow-up visit.
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**SMBP versus Office Visit**

For SMBP measurement interpretation, an average systolic and diastolic BP of 135/85 mm Hg is considered equivalent to 140/90mm Hg in the office setting.

**SMBP for Treatment Intensification**

- Ideally, obtain BP readings beginning 2 weeks after a change in the treatment regimen and during the week before a follow-up visit.
- Instruct the patient to take at least 2 readings, 1 minute apart in the morning before taking medications and 2 readings, 1 minute apart in the evening. Measure and record BP daily for 3-7 consecutive days.

# Customizable Blood Pressure (BP) Treatment Template for Patients with Stage 1 Hypertension (HTN) Not on Medication

For adults without HF, CKD (including renal transplantation), DM, metabolic syndrome, pregnancy, history of CVA, SIHD, atrial fibrillation, valvular heart disease or aortic disease.

**For All Patients with HTN**

- Patient-specific factors, such as age, concurrent medications, drug adherence, drug interactions, the overall treatment regimen, out-of-pocket costs, and comorbidities, should be considered when choosing medication.
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## Examples of Possible Blood Pressure Medication Choices

This page provides a “menu” of drug options from which to customize the BP Treatment Algorithm Template to be in alignment with local pharmacies and formularies to optimize ease of access and minimize patient cost.

### Calcium Channel Blockers (CCB) - dihydropyridines

- Amlodipine
- Felodipine
- Isradipine
- Nicardipine SR
- Nifedipine LA
- Nisoldipine

### Thiazide or Thiazide- Type Diuretics

- Chlorthalidone
- Hydrochlorothiazide
- Indapamide
- Metolazone

### Single Pill Combination (SPC) Examples

- Benazepril and hydrochlorothiazide
- Captopril and hydrochlorothiazide
- Lisinopril and hydrochlorothiazide
- Losartan and hydrochlorothiazide
- Valsartan and hydrochlorothiazide
- Amlodipine and benazepril
- Amlodipine and losartan
- Amlodipine and enalapril

### Angiotensin-Converting Enzyme Inhibitors (ACEI)

- Benazepril
- Catopril
- Enalapril
- Fosinopril
- Lisinopril
- Moexipril
- Perindopril
- Quinapril
- Ramipril
- Trandolapril

### Angiotensin Receptor Blockers (ARB)

- Azilsartan
- Candesartan
- Eprosartan
- Irbesartan
- Losartan
- Olmesartan
- Telmisartan
- Valsartan



## Key of Abbreviations for NHCI Blood Pressure Treatment Algorithms

- ACEI: Angiotensin-Converting Enzyme Inhibitor
- ASCVD: Atherosclerotic Cardiovascular Disease
- ARB: Angiotensin Receptor Blocker
- BP: Blood Pressure
- CCB: Calcium Channel Blocker
- CKD: Chronic Kidney Disease
- CVA: Cerebrovascular Accident
- CVD: Cardiovascular Disease
- DM: Diabetes Mellitus
- ER: Emergency Room
- HF: Heart Failure
- HTN: Hypertension
- NSAIDS: Nonsteroidal Anti-Inflammatory Drugs
- SIHD: Stable Ischemic Heart Disease
- SMBP: Self Measured Blood Pressure
- SPC: Single Pill Combination

## Reference for NHCI Blood Pressure Treatment Algorithms

The NHCI Blood Pressure Treatment Algorithms and Templates have been informed by 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: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.

Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, DePalma SM, Gidding S, Jamerson KA, Jones DW, MacLaughlin EJ, Muntner P, Ovbiagele B, Smith SC Jr, Spencer CC, Stafford RS, Taler SJ, Thomas RJ, Williams KA Sr, Williamson JD, Wright JT Jr. 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: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2018 May 15;71(19):e127-e248. doi: 10.1016/j.jacc.2017.11.006. Epub 2017 Nov 13. Erratum in: *J Am Coll Cardiol*. 2018 May 15;71(19):2275-2279. PMID: 29146535.