Hypertension Care Guide

October 2024

CALIFORNIA CORRECTIONAL
HEALTH CARE SERVICES

Information contained in the Care Guide is not a substitute for a health care professional's clinical judgment. Evaluation and treatment should be tailored to the individual patient and the clinical circumstances. Furthermore, using this information will not guarantee a specific outcome for each patient. Refer to "Disclaimer Regarding Care Guides" for further clarification.

https://cchcs.ca.gov/clinical-resources/

Table of Contents

GOALS

- ✓ **Identify and treat patients on the basis of primary vs secondary prevention for atherosclerotic cardiovascular disease (ASCVD)**
- ✓ **Counsel all patients on healthy lifestyle choices**
- ✓ **Goal BP < 130/80 mmHg for most patients <65 years old (yo) treated with antihypertensive medications**
- ✓ **Shared decision-making strategies for patients ≥65 yo**

ALERTS

- **Systolic blood pressure (SBP) ≥ 180**
- **Diastolic blood pressure (DBP) ≥ 120**
- **Evidence of target organ damage (TOD) (See page 8)**
- **Hypertension (HTN) with chest pain or symptoms of acute coronary syndrome (ACS)**
- **Signs of secondary HTN**

OVERVIEW

Atherosclerotic cardiovascular disease (ASCVD) remains the leading cause of morbidity and mortality globally and in the United States. This is attributable to suboptimal implementation of prevention strategies and uncontrolled ASCVD risk factors. It is important to distinguish primary prevention from secondary prevention when considering HTN treatment.

Clinical ASCVD is defined as the following conditions that result from atherosclerosis:

- Ischemic heart disease
  - Acute coronary syndrome (ACS)
  - History of myocardial infarction (MI)
  - Stable or unstable angina
  - Significant coronary artery stenosis
  - Prior coronary or other arterial revascularization
- Cerebrovascular disease
  - Stroke/transient ischemic attack (TIA)
  - Significant intracranial or extracranial artery stenosis
  - Symptomatic vertebral artery stenosis
- Peripheral artery disease (PAD)
  - Symptomatic, such as claudication
  - Asymptomatic with abnormal resting Ankle-Brachial Index (ABI) ≤ 0.90
- Aortic aneurysm
  - Thoracic aortic aneurysm
  - Abdominal aortic aneurysm
  - Atheroma on imaging

One of the facets of prevention is identifying and treating HTN. **Primary prevention** refers to the effort to prevent or delay the onset of clinical ASCVD. **Secondary prevention** refers to the effort to treat clinical ASCVD and to reduce the risk of future clinical events and death.

SCREENING

The United States Preventive Services Task Force (USPSTF) recommends all adults, 18 yo and older, should be screened for HTN, as well as risk factors that increase a patient's risk for HTN. HTN screening should be repeated every 3-5 years for patients 18-39 yo, who are not at increased risk of HTN and who have had prior normal BP measurements. Otherwise, HTN screening should occur annually for adults ≥ 40 yo or in those patients with an increased risk of HTN or with elevated BP.

Risk factors that increase a patient's risk for HTN include older age, Black race, family history, overweight and obesity, lifestyle habits (lack of physical activity, stress, and tobacco use), and dietary factors (diet high in fat or sodium, diet low in potassium, or excessive alcohol intake).

HEALTH EQUITY ALERT

Black patients are more likely to develop HTN at an earlier age, have high average BP, and have lower rates of HTN control, often leading to poor cardiovascular health outcomes. Studies show that community outreach models address poor adherence to medication and poor access to care. National public health efforts to address HTN health disparities include emphasizing self-measured BP, continuous ambulatory BP monitoring, optimizing health information technology (HIT) research, and efforts to increase medication adherence and capture ASCVD risk. Nursing-Led Therapeutic Groups (NLTG) and Peer Support Specialists can provide outreach within CCHCS to patients with HTN.

OVERVIEW CONT'D

DIAGNOSTIC CRITERIA

The classification and stages of hypertension in adults are defined by the 2017 American College of Cardiology/American Heart Association (ACC/AHA) Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults and endorsed by the American Geriatrics Society (AGS). The recommendations made by the ACC/AHA in 2017 are followed by the 2023 American Diabetes Association (ADA) *Standards of Care in Diabetes*.

CATEGORIES OF BP			
BP Category	**SBP**		**DBP**
Normal	<120 mmHg	and	<80 mmHg
Elevated	120-129 mmHg	and	<80 mmHg
Stage 1 Hypertension	130-139 mmHg	or	80-89 mmHg
Stage 2 Hypertension	≥140 mmHg	or	≥90 mmHg
Resistant Hypertension	≥130 mmHg	or	≥ 80 mmHg
	despite lifestyle and a diuretic with 2 other antihypertensives at optimal doses		

Patients with SBP and DBP in 2 categories should be designated to the higher BP category.

The definition of HTN varies depending on which guidelines are reviewed. Normal BP is accepted as < 120/80 mmHg. The Joint National Committee (JNC) released the Eighth JNC HTN guidelines in 2014 without further updates. These HTN guidelines were endorsed by the American College of Physicians (ACP) and American Academy of Family Practitioners (AAFP) in 2017, but AAFP released new BP target in updated guidelines from 2022. The International Society of Hypertension updated their guidelines in 2020 and the European Society of Hypertension Council in 2021, both of which support different BP goals by age. Lastly, the Kidney Disease Improving Global Outcomes (KDIGO) Work Group released their guidelines for management HTN in CKD with more aggressive BP targets than the 2017 ACC/AHA recommendations.

ASSESSMENT

History: Including age of elevated BP or HTN onset and pertinent symptom review for cardiovascular disease (CVD) or TOD. Review medications, personal ASCVD risk factors, clinical ASCVD, and family history of ASCVD, DM, or CKD. Consider checking over-the-counter [OTC] and herbals use, substance use and tobacco use history, sleep time, and apnea.

Physical Exam: Acquire accurate BP measurements in both arms. (See page 9). BP average is more precise if more measurements are taken. If diagnosis is in question, consider short duration of more frequent BP measurements through nurse visits. Additionally, include cardiovascular exam and pulmonary exam. Consider checking pulses and bruits, thyroid palpation, abdominal exam for organomegaly or pulsatile aorta, edema, and neurologic exam. If the patient presents with acute or progressive symptoms and/or signs of target organ damage (TOD) in the setting of SBP ≥ 180 mmHg or DBP ≥ 120 mmHg, transfer patient to higher level of care (HLOC).

Calculate ASCVD Risk Level: Calculate 10-year ASCVD risk in all adults 40-75 yo without clinical ASCVD. Patients with clinical ASCVD are already at very high-risk or high-risk for future ASCVD events, so calculating 10-year risk of ASCVD by using the pooled cohort equations (PCE) is not needed.

For primary prevention, assess and document traditional cardiovascular risk factors and calculate 10-year risk of ASCVD for patients 40-75 yo by using the race- and sex-specific PCE, which is based on sex, age, race, total cholesterol, HDL-C, blood pressure, and history of diabetes mellitus (DM), and smoking history using EBM Calc ASCVD Tool, modeled after the American College of Cardiology (ACC) ASCVD risk calculator (Risk Estimator Plus) and determine appropriate HTN therapy based on the patient's BP and their ASCVD risk calculation. (See page 14). See discussions on cardiovascular risk also in the Dyslipidemia Care Guide and Diabetes Care Guide.

OVERVIEW CONT'D

Initial Diagnostic Evaluation: Basic initial testing may include electrocardiogram (ECG), urinalysis (UA), blood glucose, complete blood count (CBC), sodium, potassium, calcium, creatinine with eGFR, lipid panel, and thyroid-stimulating hormone (TSH).

Additional testing may include pregnancy test, uric acid, urine toxicology screen, urinary albumin to creatinine ratio, and echocardiography (echo). Screen for secondary HTN for patients with sudden-onset HTN or severe elevation of BP. (See page 11-12).

Lastly, screening for and management of other modifiable CVD risk factors are recommended in patients with HTN.

CARDIOVASCULAR DISEASE RISK FACTORS IN PATIENTS WITH HTN	
Modifiable Risk Factors	**Relatively Fixed Risk Factors**
Current cigarette smoking	CKD
Secondhand smoking	Family history
DM	Increased age
Dyslipidemia	Low socioeconomic or educational status
Overweight and obesity	Male sex
Physical inactivity or low fitness	Obstructive sleep apnea
Unhealthy diet	Psychosocial stress

TREATMENT

Therapeutic Lifestyle Changes and Patient Education: Heart healthy diet with decreased daily intake of sodium, increase aerobic exercise (e.g., brisk walking at least 30 min/day most days of week), smoking cessation, avoiding alcohol consumption, and weight loss if needed.

Medication: Choose based on comorbid clinical conditions and patient preference (See pages 15-40).

- Initial drug therapy: Typically, thiazide diuretic or angiotensin converting enzyme inhibitor (ACEi)/angiotensin receptor blocker (ARB), or calcium channel blocker (CCB). (See table page 15-16).
- Beta blockers are less effective at controlling BP and NOT first line therapy unless patient has another primary indication for beta blocker use, such as left ventricular ejection fraction (LVEF) ≤ 50% or recent MI
    - In patients with chronic coronary disease who were initiated on beta blocker therapy for previous MI without a history of or current LVEF ≤ 50%, angina, arrhythmia, or uncontrolled HTN, it may be reasonable to reassess the indication of long-term beta blocker (>1 year) therapy for reducing major adverse cardiovascular events (MACE)
- Follow guideline-directed medical therapy (GDMT) for heart failure (HF). See Heart Failure Care Guide to guide medical decision making for heart failure with reduced ejection fraction (HFrEF), heart failure with mildly reduced ejection fraction (HFmrEF), and heart failure with preserved ejection fraction (HFpEF)
    - Angiotensin receptor-neprilysin inhibitor (ARNi): sacubitril/valsartan nonformulary with use criteria
    - ACEi/ARB: if there is no indication to start ARNi
    - Mineralocorticoid receptor antagonists (MRA): **spironolactone** or eplerenone nonformulary
    - Beta blocker: **carvedilol**, **metoprolol succinate**, or bisoprolol nonformulary
- Initiate therapy with two antihypertensive medications from different classes if BP ≥ 160/100 at diagnosis or if BP is > 20mmHg/10mmHg above recommended BP target (See next page)
- Diuretics should usually be included in any regimen of three or more drugs.
- BP not controlled with 3 meds: evaluate for adherence, secondary HTN, and need for specialty referral

OVERVIEW CONT'D

MONITORING

Follow-up visits: Check BP at every visit. In general, see a primary care team member at least monthly until BP is controlled. BP checks can be nurse visits, then the provider reviews and adjusts therapy as clinically indicated. Monitor adequacy and aggressively control all other ASCVD risk factors. See Dyslipidemia Care Guide, Diabetes Care Guide, and Weight Management Care Guide.

As you will notice in the following table, there are different national and international blood pressure goals. Additionally, there are discrepancies in the definition of elderly or older adults among the different guidelines.

COMPARISON OF RECOMMENDED BLOOD PRESSURE TARGETS BY GUIDELINES*				
Guideline	**18-59 yo (mmHg)**	**60-69 yo (mmHg)**	**70-79 yo (mmHg)**	**≥80 yo (mmHg)**
2017 ACC/AHA	<130/80	<130/80	<130/80	<130/80
2022 AAFP	<140/90	<140/90	<140/90	<140/90
2022 National Institute of Health and Care Excellence	<140/90	<140/90	<140/90	<150/90
2021 KDIGO	SBP<120	SBP<120	SBP<120	SBP<120
2021 European Society of Hypertension Council	<130/80	<130/80	<140/80	<140/80
2020 International Society of Hypertension	<130/80	<140/90	<140/90	<140/90
2014 Eighth Joint National Committee (JNC 8)	<140/90	<150/90	<150/90	<150/90

* When choosing a BP target for a particular patient, consider patient characteristics, such as age and any existing comorbidities (such as DM, heart disease, kidney disease, etc.) and document the patient's BP target. Population management goals are not individual goals, for which a patient's unique medical scenario and the weighing of risks and benefits are considered. (See page 15-16).

Screen for secondary HTN for patients with severe elevation of BP, sudden onset HTN, increased BP in previously controlled HTN, pharmacologically resistant HTN, onset of diastolic hypertension in older adults, and TOD disproportionate to the duration and severity of HTN. (See page 11-12).

HYPERTENSION TREATMENT ALGORITHM

Patient presents with elevated BP. Perform comprehensive evaluation including the following:

- Complete **history** and **physical exam**, consider the degree of BP elevation
- Make note of risk factors for developing primary HTN (See page 9)
- Document history of **DM**, **clinical ASCVD**, **HF**, and/or **CKD**
- Other traditional risk factors for CVD: dyslipidemia, family history of premature ASCVD, tobacco use, physical inactivity, poor diet, and overweight/obesity. Consider nontraditional risk factors as well as sex-specific biological risk factors
- **Labs** and other initial diagnostic testing to assess for comorbidities and long-term TOD
- Special considerations for **shared decision-making**: Frail, older adults ≥ 65 yo, history of labile BP with hypotension, ≥ 3 BP meds, decreased life expectancy, comorbid conditions

Alerts for Secondary HTN?
See page 11-12

Pre-HTN BP:
120-129/<80

Encourage healthy living. Recommend **Therapeutic Lifestyle Intervention**, if appropriate (See page 14)

Recheck in 1 year

Primary HTN Confirmed
(At least 2 BPs from the last 2 visits)

Risk Stratification

- Identify patients with clinical ASCVD
- If no clinical ASCVD, calculate 10-year ASCVD risk

Hypertensive urgency or emergency > 180/> 120
(See Algorithm on next page)

BP Threshold to Start Antihypertensive Medication (See page 14)

- Recommend **Therapeutic Lifestyle Intervention** for all HTN patients
- Patient education: heart healthy diet, decrease salt intake, increased potassium in diet, increase exercise, limit alcohol, decrease BMI (lose weight)
- Start medication for patients with BP ≥130/80 who have DM, CKD, clinical ASCVD, or 10-year ASCVD risk ≥10% (Goal BP < 130/80)
- If 10-year ASCVD risk <10%, start medication for patients with BP ≥140/90 (Goal BP < 130/80)

First-Line Medication

- Depending on patient factors and/or comorbidities, start thiazide or ACEi/ARB or CCB (See page 15 for Medication Choices by Condition)
- Consider starting 2 antihypertensive medications from different drug classes for patients < 65 yo if SBP ≥ 20 mmHg above goal or DBP ≥10 mmHg above goal

Recheck in 1 Month by Primary Care Team Member*

- If not at goal, add another first-line agent from a different drug class (preferred) or increase dose of first medication for ≥65 yo

Recheck in 1 Month by Primary Care Team Member*

- If still not at goal, consider different medication or continue dose escalation or add a third agent, if tolerated
- Consider adherence issues: make medication NA/DOT for a time

Recheck Monthly Until BP Goal Achieved

- If consistently not at goal on at least 2 medications, re-evaluate for secondary causes and consider referral to a nephrologist

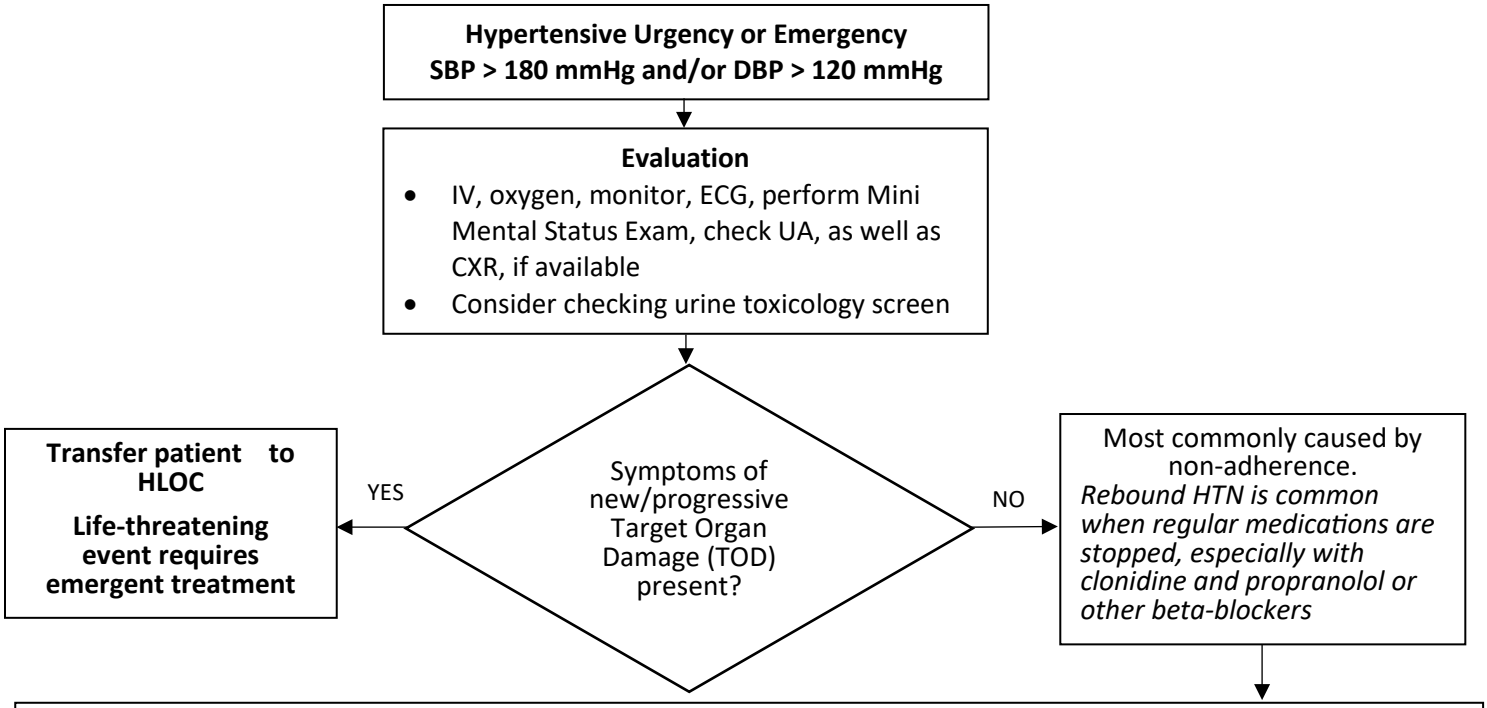
After BP Goal Achieved

- **PCP reassess 3-6 months**
- If baseline ASCVD risk < 10%, recalculate 10-year ASCVD risk annually for patients with DM and at least every 4-6 years if 10-year ASCVD risk < 5% for non-DM
- Reassess patient after clinical changes/defining clinical event

*** Nursing alerts driven by provider orders:**

- **Nurse BP check:** document in progress note and send to PCP
- **If SBP < 100:** co-consult with PCP and document in progress note
- **If BP ≥ 160/100:** co-consult with PCP, document in progress note, and discuss at huddle
- **For BP > 180/120:** co-consult PCP or physician on call for immediate evaluation, then document in progress note

HYPERTENSIVE URGENCY OR EMERGENCY TREATMENT ALGORITHM



* SIGNS AND SYMPTOMS OF TARGET ORGAN DAMAGE		
Symptoms	**End Organ Damage**	**Signs**
CNS changes/nausea/vomiting	Brain injury, encephalopathy, stroke, or intracranial hemorrhage (ICH)	Decreased Glasgow Coma Score (GCS), increased intracranial pressure, acute neurologic changes
Visual disturbance	Hypertensive retinopathy or optic neuropathy	Papilledema, flash flame hemorrhages, exudates/cotton wool spots
Chest pain/upper thoracic discomfort/ripping sensation	Acute coronary syndrome (ACS) or aortic dissection	Positive ACS biomarkers, abnormal ECG, BP differential between the two arms, TEE, or CT for dissection
Dyspnea	Pulmonary edema	Fluid overload, pedal edema, CXR findings
Hematuria	Acute hypertensive nephrosclerosis	Red blood cells in urinary sediment
Headache, abdominal pain, palpitations	Pheochromocytoma crisis	Hyperthermia, multiorgan dysfunction
Fetal distress/maternal swelling/headache	Severe preeclampsia/eclampsia	Fetal distress on monitor, pedal edema, ↑ urination, proteinuria

ASSESSMENT

HISTORY

- Personal history of high BPs (consider degree of BP elevation and age of onset)
- Risk factors for developing primary HTN (See table below)
- History of **DM** and TOD, including **clinical ASCVD**, **HF**, and/or **CKD**
- Other traditional risk factors for CVD: dyslipidemia, family history of premature ASCVD, tobacco use, physical inactivity, poor diet, overweight/obesity; consider nontraditional risk factors as well as sex-specific biological risk factors, such as anxiety/depression/stress, history of preeclampsia/eclampsia, menopause, etc.
- Medications: Prescribed, OTC, substance use, and alcohol intake
- Family history of HTN, premature ASCVD, hemochromatosis, or CKD
- Alerts for secondary HTN (See page 11-12)
- Patients with clinical ASCVD are already high risk for future ASCVD events, so calculating 10-year risk of ASCVD by using the pooled cohort equations (PCE) is not needed
- For patients without clinical ASCVD, calculate 10-year ASCVD risk by using the race- and sex-specific PCE, which is based on sex, age, race, total cholesterol, HDL-C, blood pressure, and history of diabetes mellitus (DM), and smoking history using **EBM Calc ASCVD Tool** in Electronic Health Record System (EHRS), modeled after the American College of Cardiology (ACC) ASCVD risk calculator (Risk Estimator Plus)

Risk Factors for Developing Primary HTN	
Can Be Controlled	**Cannot Be Controlled**
• Overweight or obese • Sedentary lifestyle/lack of physical activity • High sodium diet (> 3 gm/day) • High alcohol consumption	• Age/gender • Race: (Black patients have earlier or more severe TOD) • Family history • CKD

PHYSICAL EXAM

Taking a proper BP measurement

1) STEP 1: Properly prepare the patient during the rest period
   a) Ask patient if there are any factors that may cause inaccurate BP measurement. (See "Ask the Patient" box) Patient should be relaxed and seated in a chair with uncrossed feet flat on the ground and back supported.
   b) Remove all clothing covering cuff placement area; arm should be supported at heart level (midpoint of the sternum).
   c) Rest > 5 min in this position.
   d) No talking during this rest period.

Ask the Patient:

- Recent (30 minutes) caffeinated beverages?
- Recent (30 minutes) nicotine?
- Recent (30 minutes) exercise?
- In pain?
- Bladder empty?
- If/when took BP meds today?

2) STEP 2: Use proper technique for BP measurements
   a) Recommended: Use an automated oscillometric BP machine that has been calibrated or validated.
   b) If using a sphygmomanometer, inflate to at least 30 mmHg above point where radial pulse disappears; rate of deflation should be 2mmHg/second or slower for patients with bradycardia to obtain an accurate reading.
   c) Use the appropriate cuff size with the bladder of the cuff encircling ≥ 80% of the arm.
   d) Cuff should be taut with comparable tightness at top and bottom cuff edges. 1 finger should fit easily at top and bottom, 2 fingers should fit snugly.
3) STEP 3: Take the proper measurements needed for diagnosis and treatment of elevated BP or HTN
   a) Take BP measurements of both arms. Use the arm that gives the higher reading for subsequent reading.
   b) Separate BP measurements by 1-2 minutes.
4) STEP 4: Properly document accurate BP readings in the EHRS
   a) Document the date and time of the BP measurement, as well as the arm measured, and cuff size used
   b) Document SBP and DBP
5) STEP 5: Average ≥ 2 BP readings obtained on ≥ 2 occasions
6) STEP 6: Provide BP readings to patient to encourage shared-decision making

ASSESSMENT CONT'D

- **Vital signs**: Take BP on both arms and average the measurements. Consider orthostatic measurements in older patients or those who are prone to hypotension depending on history. (See Taking a Proper BP section above)
  Note: > 15 mmHg differential between the upper extremities could be subclavian steal or PAD
  Tachycardia (Consider thyroid/SUD: cocaine/methamphetamine)
  Bradycardia (Consider hypothyroidism)
- Calculate Body Mass Index (**BMI**) in EHRS
- **Cardiovascular exam**
- **Pulmonary exam**
- Consider fundoscopic exam – best performed by ophthalmologist or optometrist
- Consider checking pulses and bruits, thyroid palpation, abdominal exam for organomegaly or pulsatile aorta, edema, and neurologic exam.
- Alerts for secondary HTN (See page 11-12)
- If the patient presents with acute or progressive symptoms and/or signs of target organ damage (TOD) in the setting of SBP ≥ 180 mmHg or DBP ≥ 120 mmHg, transfer patient to higher level of care (HLOC)

DIAGNOSTIC EVALUATION

Look for evidence of long-term TOD, such as left ventricular hypertrophy (LVH), HF, retinopathy, evidence of prior stroke/TIA, evidence of coronary artery disease (CAD) or MI/CABG, evidence of PAD, CKD, erectile dysfunction, and vascular dementia.

Labs

- **UA**: Abnormal (non-infectious) urinalysis especially proteinuria.
- **Urinary albumin to creatinine ratio**: especially in patients with DM and CKD.
- **CBC**: Evidence of anemia can be suggestive of renal disease.
- **Basic metabolic panel**: Look for eGFR for evidence of CKD and for low K+ with paradoxical urinary wasting (high urine K+ and metabolic alkalosis), which may represent primary aldosteronism. Additionally, metabolic acidosis may be due to binging on pruno/alcohol or CKD. Lastly, look for blood glucose for undiagnosed DM.
- **Calcium**: Look for hypercalcemia (hyperparathyroidism is associated with refractory HTN).
- **Lipid panel**: Contributes to ASCVD risk
- **TSH**
- **Pregnancy test**: for those of childbearing age
- Consider **screening for secondary hypertension** in patients with acute-onset, uncontrolled, or resistant HTN. These patients may have drug-resistant or drug-induced HTN, abrupt onset of HTN, onset of HTN < 30 yo, exacerbation of previously controlled HTN, disproportionate TOD for degree of HTN, accelerated or malignant HTN, onset of diastolic HTN in adult ≥ 65 yo, or unprovoked or excessive hypokalemia. (See page 11-12).

Other Diagnostic Testing

A baseline **ECG** should be considered to look for evidence of ischemia/infarction or LVH. Also consider **echo** evaluation recommended when suspect left ventricular (LV) dysfunction, CAD, or evidence of HF.

RISK STRATIFICATION

Patients with clinical ASCVD are already high risk for future ASCVD events, so calculating 10-year risk of ASCVD by using the PCE is not needed.

For patients without clinical ASCVD, calculate 10-year ASCVD risk by using the race- and sex-specific PCE, which is based on sex, age, race, total cholesterol, HDL-C, blood pressure, and history of diabetes mellitus (DM), and smoking history using **EBM Calc ASCVD Tool** in Electronic Health Record System (EHRS), modeled after the American College of Cardiology (ACC) ASCVD risk calculator (Risk Estimator Plus). This will establish the BP threshold for treatment.

SECONDARY CAUSES OF HYPERTENSION

IDENTIFIABLE CAUSES OF SECONDARY HYPERTENSION

GENERAL CONSIDERATIONS	CLINICAL FEATURES	EVALUATION FOR THE CAUSE
When to Consider Secondary Causes of HTN	***FIRST CONFIRM MEDICAL REGIMEN ADHERENCE*** • Severe (SBP > 180 and/or DBP > 110) HTN • Resistant HTN (BP not at goal despite concurrent use of 3 antihypertensive agents of different classes, one of which should be diuretic) • Drug-induced HTN • Abrupt onset of HTN • Acute rise in BP over a previously stable value • Age of onset before puberty • Age < 30 yo without HTN family history or obesity • Onset of diastolic HTN in older adults (≥ 65 yo) • Disproportionate TOD for degree of HTN • Unprovoked or excessive hypokalemia	**As indicated based on history**
Drug induced/related **SUD** *(See section below)*	• Taking a medication associated with elevating BP	Trial off drug, if possible
Acute kidney injury (AKI) and CKD	• Poorly controlled BP, edema, fatigue, frequent urination anemia, abnormal urinalysis	Serum creatinine, eGFR, renal US
Sleep Apnea	• Primarily seen in obese men who snore • Daytime somnolence, fatigue, morning confusion	Sleep study
Primary Aldosteronism (Mineralocorticoid EXCESS)	• Triad: HTN, unexplained hypokalemia , and metabolic alkalosis; muscle weakness and cramps • Hypokalemia with urinary potassium wasting. More than 50% of patients are normokalemic	Ratio of plasma aldosterone to plasma renin activity
Thyroid Disease	• Hypothyroidism (bradycardia, dry skin, weight gain, cold intolerance) • Hyperthyroidism (tachycardia, weight loss, palpitations, heat intolerance)	TSH
Primary Hyperparathyroidism	• History of kidney stones < 20 yo • Muscle weakness, osteoporosis	Serum calcium, serum phosphorus, parathyroid hormone levels
Renovascular Disease *Older patient: ASCVD* *Younger patient: Fibromuscular Dysplasia*	• An acute elevation in serum creatinine after administration of ACEi or ARB • Moderate-severe HTN in a patient with diffuse atherosclerosis or a unilateral small kidney • Repeated episodes of flash pulmonary edema • Systolic-diastolic bruit (not very sensitive)	Screen only if a corrective procedure would be considered for the patient. Most invasive interventions are reserved for fibromuscular dysplasia. • Magnetic resonance angiography • CT angiography • Duplex Doppler ultrasonography **Only order on recommendation of nephrologist** Renal arteriogram gold standard but is an invasive test.
Cushing's Syndrome (rare) or steroid therapy	• Cushingoid facies, central obesity, proximal muscle weakness, and ecchymoses	Dexamethasone-suppression test
Pheochromocytoma (rare)	• Paroxysmal elevations in BP • Dizziness and episodic pallor • Triad of headache, palpitations, and sweating	24-hour urine catecholamines and metanephrines
Coarctation of the aorta or history of repair	• HTN in arms with diminished/delayed femoral pulses and low/unobtainable BP in the legs • Rib notching noted on CXR	Doppler or CT imaging of aorta

SECONDARY CAUSES OF HYPERTENSION CONT'D

COMMON DRUGS THAT CAUSE HYPERTENSION

SUBSTANCE	POSSIBLE MANAGEMENT STRATEGY
Alcohol	• Limit alcohol to ≤ 1 drink daily for women • Limit alcohol to ≤ 2 drinks for men
Amphetamines (e.g., amphetamine, methylphenidate dexmethylphenidate, dextroamphetamine)	• Discontinue or avoid use of illicit substances • Discontinue or decrease dose • Consider behavioral therapy for attention-deficit/hyperactivity disorder
Antidepressants (e.g., monoamine-oxidase inhibitors [MAOI], selective norepinephrine reuptake inhibitors [SNRI], and tricyclic antidepressants [TCA])	• Consider alternative agent (e.g., selective serotonin reuptake inhibitor) 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 • 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 is associated with acute increases in BP; long-term use is 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
Herbal supplements (e.g., Ma Huang [ephedra], St. John's wort [with MAOIs, yohimbine])	• Avoid use
Immunosuppressants (e.g., cyclosporine)	• Consider converting to tacrolimus, which may be associated with fewer effects on BP
Oral contraceptives	• Use low-dose (e.g., 20–30 mcg ethinyl estradiol) agents or a progestin-only form of contraception, or consider alternative forms of birth control where appropriate (e.g., barrier, abstinence, IUD) • Avoid use in patients with uncontrolled hypertension
NSAIDs	• Avoid systemic NSAIDs when possible • Consider alternative analgesics (e.g., acetaminophen, tramadol, topical NSAIDs), depending on indication and risk
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 (e.g., bevacizumab) and tyrosine kinase inhibitors (e.g., sunitinib, sorafenib)	• Initiate or intensify antihypertensive therapy

This is not an all-inclusive list of substances/medications that can increase blood pressure

TREATMENT GOALS

Individualize BP treatment goal:

- The provider should consider patient characteristics, such as age and any existing comorbidities (such as DM, heart disease, CKD, etc.) and document the patient's BP target in EHRS.
- **Shared decision-making** is encouraged when setting BP targets, especially in older patients (≥65 yo) who may experience serious side effects with attempts at tight BP control with multiple medications. Equally important in older patients is the ability to remain independent, with a focus on maintaining their mobility and functional status, rather than reducing their mortality rate. For noninstitutionalized ambulatory community-dwelling adults ≥ 65 yo who are prescribed antihypertensive medication, the BP goal is <130/80. However, for older adults ≥ 65 yo with a high burden of comorbidity and limited life expectancy, assess the risks/benefits regarding the intensity of BP lowering and choice of antihypertensive medications and account for patient preference, clinical judgement, and "The 5 Ms of Geriatric Care" to guide shared decision-making.

THE 5 Ms OF GERIATRIC CARE	
Mind	Mentation, dementia, delirium, depression
Mobility	Impaired gait and balance, fall injury prevention
Medications	Polypharmacy/deprescribing, optimal prescribing, adverse effects, medication burden
Multi-complexity	Multimorbidity. Complex biopsychosocial situations
Matters Most	Each individual's own meaningful health outcome goals and care preferences

- **Different recommendations of blood pressure treatment targets**: As you will notice in the following table, there are different national and international blood pressure goals. Additionally, there are discrepancies in the definition of elderly or older adults among the different guidelines.

COMPARISON OF RECOMMENDED BLOOD PRESSURE TARGETS BY GUIDELINES*				
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2022 National Institute of Health and Care Excellence	<140/90	<140/90	<140/90	<150/90
2021 KDIGO	<120	<120	<120	<120
2021 European Society of Hypertension Council	<130/80	<130/80	<140/80	<140/80
2020 International Society of Hypertension	<130/80	<140/90	<140/90	<140/90
2014 Eighth Joint National Committee (JNC 8)	<140/90	<150/90	<150/90	<150/90

Aspirin for primary prevention of ASCVD is no longer recommended in people with HTN in the absence of other indications. For information regarding dyslipidemia treatment and LDL-C goals for primary prevention, please refer to the Dyslipidemia Care Guide.

PATIENT EDUCATION AND ENGAGEMENT

Patient education increases motivation for lifestyle changes and medication adherence.

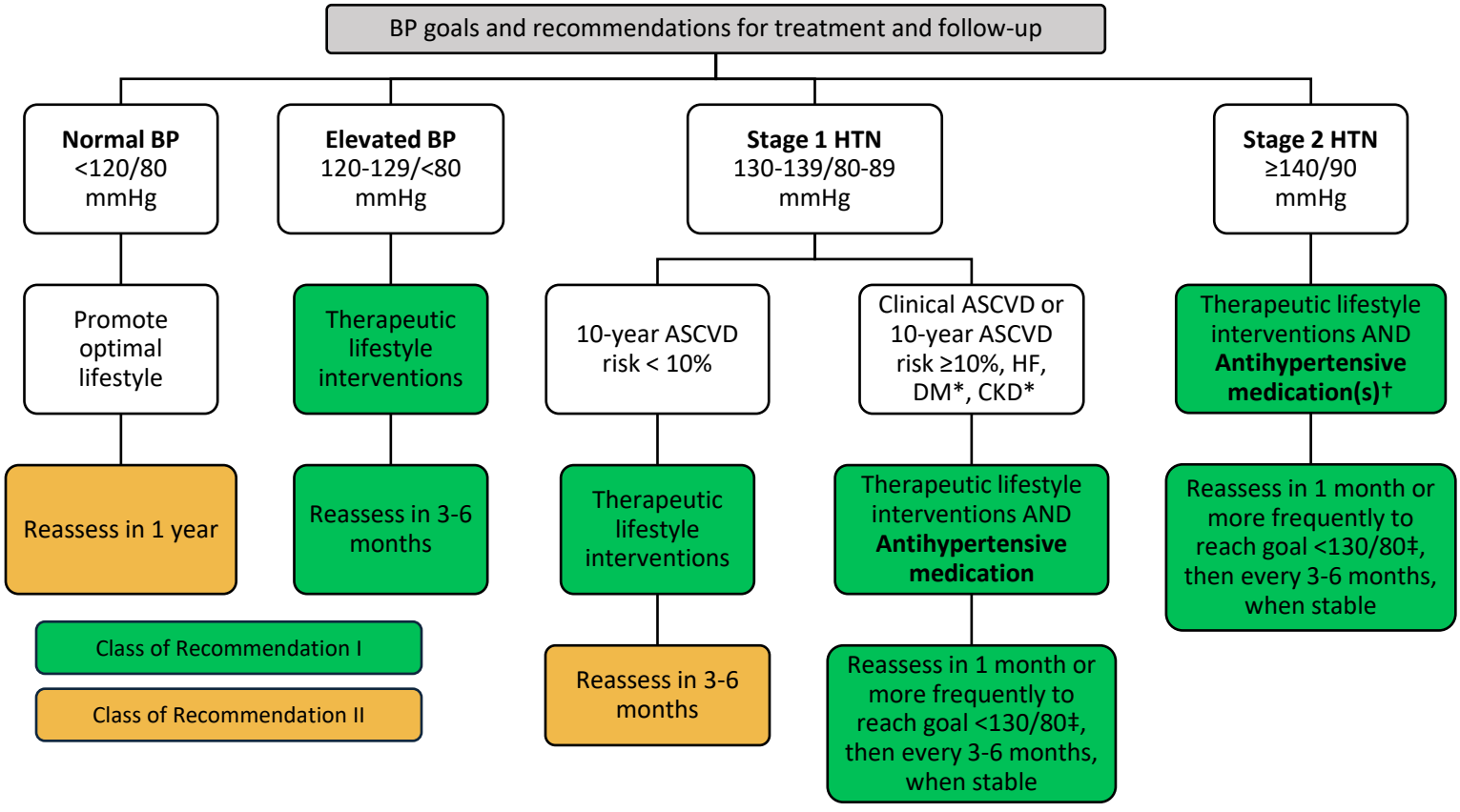
- Explain the importance of knowing how their BP levels compare to normal and the steps needed to reach their BP goal. Write a "Know Your Numbers" sheet (See Patient Education PE-2) to set personal goals for weight, activity, DM, HTN and lipid control.
- Use motivational interviewing and non-judgmental language.
- Review therapeutic lifestyle interventions (See section below).
- Patient empowerment: Explain relationship of HTN to ASCVD risk and importance of attention to ASCVD risk factors.
- Discuss the importance of medication adherence, and encourage patients to discuss concerns/side effects that may cause non-adherence

TREATMENT: THERAPEUTIC LIFESTYLE INTERVENTIONS

Therapeutic Lifestyle Interventions are proven to be effective in lowering blood pressure. All patients who have been diagnosed with either elevated BP or HTN, should receive patient education on therapeutic lifestyle interventions.

- A heart-healthy diet, like Dietary Approaches to Stop Hypertension (DASH):
  - Eat more fruits, vegetables, fish, poultry, nuts, unsaturated fats, and low-fat dairy
  - Limit intake of red meat, sweets, sugary drinks, saturated fats, and total fats
  - Consider dietary consult.
- Dietary Salt Restriction: Optimal goal is <1.5 g/day. Start by lowering by 1 g/day to reach <2.3 g/day
- Potassium supplementation: 3.5-5.0 g/day by diet (contraindicated in CKD and potassium retaining medications)
- Exercise: at least 90-150 min/week of aerobic activity of moderate or greater intensity and 2 days of muscle-strengthening activity. 75 minutes of vigorous-intensity activity can be sufficient in the fit or young.
  - Consider recommending 30 minutes of activity at least 5 days a week, providing examples to the patients (i.e., brisk walking, jogging, push-ups, sit-ups, body-weight squats)
- Weight loss: Lowering of weight generally lowers BP, roughly 1 mmHg for every pound lost
- HTN Clinical Practice Guidelines state insufficient evidence to recommend for/against weight loss medications for HTN15.
- Reduce or avoid alcohol intake (when in the community): Max: 2 drinks/day for men, 1 drink/day for women. (Note: There is no safe limit for alcohol to prevent HTN14). Stop smoking and stop using illicit drugs
- Stress management/assess and address mental health problems, if applicable

To treat stage 1 HTN among patients without clinical ASCVD with 10-year ASCVD risk < 10%, first-line therapy is lifestyle intervention. To treat stage 1 HTN among patients with clinical ASCVD, stage 1 HTN among patients with 10-year ASCVD risk ≥ 10%, or stage 2 HTN, promote therapeutic lifestyle intervention and start antihypertensive medication(s).



* DM or CKD are considered high-risk conditions, so antihypertensive medication should be part of initial therapy.

† For patients with Stage 2 HTN and BP ≥160/100 mmHg, consider starting 2 antihypertensive agents from different classes.

‡ For noninstitutionalized ambulatory community-dwelling adults ≥ 65 yo who are prescribed antihypertensive medication, the BP goal is <130/80. However, for older adults ≥ 65 yo with a high burden of comorbidity and limited life expectancy, assess the risks/benefits regarding the intensity of BP lowering and choice of antihypertensive medications and account for patient preference, clinical judgement, and "The 5 Ms of Geriatric Care" (See page 13) to guide shared decision-making.

TREATMENT: MEDICATION CHOICES BY CONDITION

ANTIHYPERTENSIVE MEDICATION RECOMMENDATIONS BASED ON CLINICAL FEATURES
Degree of BP lowering more important than which agent

IDENTIFIED UNDERLYING CONDITION	1st Line Therapy Monotherapy	2nd Line Therapy* Dual Therapy†	3rd Line Therapy Triple Therapy	4th Line Therapy
Non Black patients without underlying condition or DM without moderately increased albuminuria (microalbuminuria) ≥ 30 mg/g albumin to creatinine ration (UACR)	ACEi/ARB CCB Thiazide diuretic	ACEi/ARB CCB Thiazide diuretic * Adding a second agent from first-line therapy is preferred over a higher dose of monotherapy for most patients. However, an increased dose of monotherapy is an option for older adults/patients at risk for hypotension and for treated HTN near BP goal < 130/80 † Start 2 antihypertensive agents from different first-line classes for Stage 2 HTN with BP ≥ 160/100 mmHg	ACEi/ARB CCB Thiazide diuretic Thiazide diuretic or MRA, such as spironolactone should be part of a triple regimen After one dose increase of the dual therapy agents, add third agent from first line preferred over continued higher doses of dual therapy	Beta-blocker Vasodilator Alpha-blocker A diagnosis of resistant HTN is made when a patient takes 3 antihypertensive medications (1 diuretic with 2 other drug classes of antihypertensive medications or when BP goal is achieved but requires ≥ 4 antihypertensive medications See Resistant HTN Algorithm on page 17.
Black patients without underlying condition, such as DM, CKD, or HF	CCB Thiazide	Higher doses or combine thiazide and CCB ARB/ACEi		
DM with microalbuminuria	ACEi/ARB CCB	Higher doses or combine ACEi/ARB and CCB thiazide diuretic		
CKD complicated by albuminuria/ proteinuria	ACEi/ARB	Diuretic		
Kidney transplant recipient	Dihydropyridine CCB ARB			
HFrEF or HFmrEF (LVEF < 50%)	ACEi/ARB/ARNi	Maximize GDMT includes: Beta blocker MRA ACEi/ARB/ARNi	Diuretic for volume overload	
HFpEF (LVEF ≥ 50%)	ARB/ARNi	MRA	Diuretic for volume overload	

Additional Medication Notes:

- If the goal BP is not reached within a month of treatment, adding a second drug is usually needed and preferred over increasing doses of the initial drug. Choose from one of the recommended classes and recheck after 1 month.
- Do not use an ACEI and ARB together.
- Avoid use of CCB with beta-blocker.

The choice of antihypertensive agents in some patients is guided by concomitant conditions and their treatment.

TREATMENT: MEDICATION CHOICES BY CONDITION CONT'D

ANTIHYPERTENSIVE MEDICATION RECOMMENDATIONS BASED ON CLINICAL FEATURES
Degree of BP lowering more important than which agent

IDENTIFIED UNDERLYING CONDITION	1st Line Therapy Monotherapy	2nd Line Therapy Dual Therapy	3rd Line Therapy Triple Therapy	4th Line Therapy
Recent MI (< 1 yr.) or chronic coronary disease with continued anginal symptoms	Beta blocker ACEi/ARB	Dihydropyridine CCB for continued angina Thiazide MRA		
Chronic coronary disease without angina	ACEi/ARB	Dihydropyridine CCB Thiazide MRA		
Atrial fibrillation/flutter (AF/AFL) with need for rate control	Dihydropyrimadole (diltiazem or verapamil) or beta-blocker	ACEi/ARB Thiazide diuretic		
AF/AFL without need for rate control	ARB (reduce AF/AFL recurrence)	CCB		
Prior stroke/TIA	Thiazide ACEi/ARB			
Thoracic aortic aneurysm	Beta blocker (avoid in aortic regurgitation)	ARB		
Pregnancy	Labetalol Nifedipine Methyldopa	Combination of first-line therapy	Furosemide	

Additional Medication Notes:

- If the goal BP is not reached within a month of treatment, adding a second drug is usually needed and preferred over increasing doses of the initial drug. Choose from one of the recommended classes and recheck after 1 month.
- Do not use an ACEI and ARB together.
- Avoid use of CCB with beta-blocker.
- The choice of antihypertensive agents in some patients is guided by concomitant conditions and their treatment.

TREATMENT: MEDICATION CHOICES BY CONDITION

RESISTANT HTN
Diagnosis, Evaluation, and Treatment

Confirm Treatment Resistance
Office BP ≥130/80 mmHg
and
Patient prescribed ≥3 antihypertensive medications at optimal doses, including a diuretic, if possible
or
Office BP <130/80 mmHg, but patient requires ≥4 antihypertensive medications

↓

Exclude Pseudoresistance
Ensure accurate office BP measurements
Assess for nonadherence with prescribed regimen

↓

Identify and Reverse Contributing Lifestyle Factors*
Obesity
Physical inactivity
High-salt and low-fiber diet

↓

Discontinue or Minimize Interfering Substances†
NSAIDs
Sympathomimetics (e.g., amphetamines, decongestants)
Stimulants

↓

Screen for Secondary HTN
See page 11-12

↓

Antihypertensive Medications
Maximize diuretic therapy
Add MRA
Add other agents with different mechanisms of action
Use loop diuretics for CKD and/or patients receiving potent vasodilators (e.g., minoxidil)

↓

Refer to a Specialist
To assess for known or suspected secondary HTN
To comanagement antihypertensive therapy if BP uncontrolled for more than 6 months

TREATMENT: MEDICATION CHOICES BY MEDICATION CLASS

Additional Considerations for Antihypertensive Drug Selection			
Drug Class	**Conditions with Potentially FAVORABLE Effects**	**Conditions with Potentially UNFAVORABLE Effects**	**Conditions to AVOID Use**
ACEi	• Elevated fasting glucose • Microalbuminuria • Low-normal potassium	• Hyperkalemia (or high-normal potassium) • Renovascular disease	• Bilateral renal artery stenosis • History of angioedema • Pregnancy • Lithium use
ARB	• Elevated fasting glucose • Microalbuminuria • Low-normal potassium	• Hyperkalemia (or high-normal potassium) • Renovascular disease	• Bilateral renal artery stenosis • Pregnancy • Lithium use
ARNi	• HF	• Hyperkalemia (or high-normal potassium) • Renovascular disease	• History of angioedema • Bilateral renal artery stenosis • Pregnancy • Lithium use
Dihydropyridine CCB (amlodipine and nifedipine XL)	• Older patients with isolated systolic HTN • Cyclosporine-induced HTN • Raynaud's phenomenon • Angina	• Avoid nifedipine in HFrEF • Peripheral edema • Tachycardia (or high-normal heart rate)	• Severe left ventricular dysfunction (except amlodipine and felodipine)
Nondihydropyridine CCBs (diltiazem and verapamil)	• Migraines • Tachycardia (or high-normal heart rate) • Supraventricular arrhythmias/Atrial Fib or flutter • Raynaud's phenomenon • Angina	• Low-normal heart rate • Peripheral edema	• Left ventricular dysfunction • 2nd or 3rd degree AV block
Thiazide-like and Thiazide-type diuretics	• Osteoporosis • High-normal potassium	• Elevated fasting glucose • Gout • Hyponatremia • Hypokalemia	• Anuria • Kidney failure • Lithium use
Loop diuretics	• Symptomatic HF causing volume overload • Preferred over thiazides in CKD eGFR < 30 mL/min		• Hypovolemia • AKI
Non-Cardioselective Beta Blocker	• Essential tremor • Migraine		
Beta Blocker	• Hyperthyroidism • Migraine • Angina • Carvedilol or metoprolol succinate for HFrEF • Atenolol may be preferred (often every other day dosing) for HTN in dialysis patients over ACEi/ARB	• Depression • Bradycardia • Uncontrolled hypothyroidism • Less effective than other antihypertensives	• Bronchospasm or asthma • 2nd or 3rd degree AV block • Not first line, unless patient has recent MI, angina, or HFrEF • Avoid abrupt cessation • Atenolol least preferred for HTN, unless patient is on dialysis
MRA	• Low normal potassium • Primary hyperaldosteronism • Resistant HTN • Part of GDMT for HF	• Hyperkalemia • Gynecomastia with spironolactone use	

TREATMENT: MEDICATION CHOICES BY MEDICATION CLASS CONT'D

Additional Considerations for Antihypertensive Drug Selection			
Drug Class	**Conditions with Potentially FAVORABLE Effects**	**Conditions with Potentially UNFAVORABLE Effects**	**Conditions to AVOID Use**
Alpha Blocker	• Benign prostatic hyperplasia	• Orthostatic hypotension, especially older patients	
Direct Vasodilators	• Angina- hydralazine • Resistant HTN (minoxidil)	• Fluid overload or risk	• Sodium and water retention- use with diuretic and beta-blocker • Hydralazine- lupus like syndrome • Minoxidil-pericardial effusions, hirsutism

[15]Tschanz CMP, Cushman WC, Harrell CTE, Berlowitz DR, Sall JL. This synopsis summarizes key features of a joint VA/DoD guideline on diagnosis and management of hypertension in the primary care setting. *Annals of Internal Medicine*. 2020;173(11):904-913. doi:10.7326/m20-3798

TREATMENT: MEDICATIONS ON CCHCS FORMULARY

Class	Drug	Usual Dose	Frequency	Comments
		Primary Agents		
DIURETICS Thiazide-like/ Thiazide-type	Hydrochlorothiazide (HCTZ)	12.5-50 mg/day	Daily	• Monitor for hyponatremia and hypokalemia, uric acid, and calcium levels, especially if metolazone is given with a loop diuretic • Use with caution in patients with history of acute gout unless the patient is on uric acid-lowering therapy, or low-normal serum potassium • May cause elevated fasting glucose • Avoid in patients with kidney failure, anuria, osteoporosis, and lithium use
	Metolazone	2.5-5.0 mg/day	Daily	
ACE INHIBITORS (ACEi)	Enalapril	5-40 mg/day	Daily or divided BID	• Favorable in elevated fasting glucose, microalbuminuria, CKD, and low-normal serum potassium • Do not use in combination with ARNi, ARBs, or direct renin inhibitor • Increased risk of hyperkalemia (or high-normal potassium), especially in patients with CKD or in those on potassium supplements or potassium-sparing medications • May cause acute renal failure in patients with severe bilateral renal artery stenosis or cause acute paradoxical HTN in renovascular disease • Do not use if history of angioedema with ACEi • Avoid in pregnancy • Avoid in lithium use • Possible link to increased lung cancer. *Hicks, BMJ 2018;363k4209 Cohort.*
	Lisinopril	10-40 mg/day	Daily	
ANGIOTENSIN RECEPTOR BLOCKERS (ARB)	Losartan *(reserved for patients intolerant to ACEi)*	25-100 mg/day	Daily or divided BID	• Favorable in elevated fasting glucose, microalbuminuria, CKD, and low-normal serum potassium • Do not use in combination with ARNI, ACEi, or direct renin inhibitor • Increased risk of hyperkalemia in CKD or pts on potassium supplements or potassium-sparing medications • 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 • Avoid in lithium use
Angiotensin Receptor-Neprilysin Inhibitor (ARNi)	Sacubitril-valsartan *(reserved for patients with HF)*	24mg/26mg-97mg/103mg	BID	• Do not use in combination with ACEi or ARBs • Increased risk of hyperkalemia in CKD or pts on potassium supplements or potassium-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema • Avoid in pregnancy • Avoid in lithium use
CALCIUM CHANNEL BLOCKERS (CCB) Dihydropyridines	Amlodipine	2.5-10 mg/day	Daily	• Favorable in: older patients with isolated systolic HTN, cyclosporine-induced HTN, Raynaud's phenomenon, angina • Avoid use of nifedipine in patients with HFrEF • Associated with dose-related pedal edema, which is more common in women than men • Likely unfavorable effect in tachycardia
	Nifedipine	30-60 mg/day	Daily	

TREATMENT: MEDICATIONS ON CCHCS FORMULARY CONT'D

Class	Drug	Usual Dose	Frequency	Comments
		Secondary Agents		
CALCIUM CHANNEL BLOCKERS (CCB) Non-Dihydropyridines	Diltiazem	180-420 mg/day	Daily	• Favorable in migraines, tachycardia (or high-normal heart rate), supraventricular arrhythmias/atrial fibrillation/atrial flutter, Raynaud's phenomenon, angina • Avoid routine use with beta-blockers due to increased risk of bradycardia & heart block • Do not use in patients with HFrEF • Drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor) • Avoid in 2nd or 3rd degree AV block
	Verapamil	80-320 mg/day	Daily or divided BID	
DIURETICS Loop	Furosemide	20-80 mg/day	Divided BID	• Preferred diuretic in patients with symptomatic HF • Preferred over thiazides in patients with moderate-to-severe CKD (e.g., GFR < 30 mL/min)
	Bumetanide	0.5-2.0 mg/day	QD	
DIURETICS Potassium-sparing	Triamterene/HCTZ	37.5-75 mg/day	QD	• Monotherapy agents minimally effective antihypertensive • 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)
DIURETICS-ALDOSTERONE RECEPTOR BLOCKER	Spironolactone	25-50 mg/day	QD	• Favorable in low-normal potassium • Preferred agents in primary aldosteronism and resistant HTN • Spironolactone associated with greater risk of gynecomastia and impotence compared to eplerenone • Common add-on therapy in resistant HTN • Avoid use with K+ supplements, K+ sparing diuretics or significant renal dysfunction • Eplerenone often requires twice daily dosing for adequate BP lowering • Monitor for hyperkalemia
BETA BLOCKERS Selective β1	Atenolol *If not on dialysis recommend switch to alternative such as metoprolol or carvedilol*	25-100 mg/day	QD/**BID** (BID dosing strongly recommended)	• Favorable in: CHF with low ejection fraction (EF) (except metoprolol tartrate-use succinate in CHF) • Beta blockers are NOT recommended as first-line agents unless the patient has ischemic heart disease or HF • Selective β1 beta-blockers preferred in patients with bronchospastic airway disease requiring a beta blocker, monitor closely • Bisoprolol, carvedilol, and metoprolol succinate preferred in patients with HFrEF. Atenolol is least preferred for HTN. If used, should be BID. Atenolol preferred if HTN on dialysis and often is QOD dosing (dialyzes off). • Avoid abrupt cessation • Avoid in 2nd or 3rd degree heart block • Potentially unfavorable effects in depression, bradycardia, and uncontrolled hypothyroidism
	Metoprolol succinate	25-200 mg/day	QD	
	Metoprolol tartrate	50-100 mg/day	QD	

TREATMENT: MEDICATIONS ON CCHCS FORMULARY CONT'D

Class	Drug	Usual Dose	Frequency	Comments
Secondary Agents				
BETA BLOCKERS Nonselective	Propranolol	60-160 mg/day	QD	• Favorable in essential tremor and migraine • Avoid in patients with reactive airways disease • Avoid abrupt cessation • Avoid in 2nd or 3rd degree heart block • Potentially unfavorable effects in depression, bradycardia, and uncontrolled hypothyroidism
BETA BLOCKERS Nonselective β/ Selective α1	Carvedilol	6.25-25 mg/day	BID	• Favorable in: CHF with reduced EF, hyperthyroidism, migraine, anxiety, and angina • Carvedilol preferred in patients with HFrEF • Avoid abrupt cessation • Monitor asthmatics closely • Avoid in 2nd or 3rd degree heart block • Potentially unfavorable effects in depression, bradycardia, and uncontrolled hypothyroidism
	Labetalol	200-800 mg/day	BID	
ALPHA BLOCKERS	Doxazosin	1-16 mg/day	QD	• Associated with orthostatic hypotension, especially in older adults • May consider as second-line agent in patients with concomitant benign prostatic hyperplasia (BPH)
	Terazosin	1-20 mg/day	QD or divided BID	
ALPHA AGONISTS	Clonidine	0.1 mg	BID	• Favorable in: BPH • Generally reserved as last-line due to significant central nervous system side effects, especially in older adults; significantly sedating • Avoid abrupt discontinuation of clonidine, which may induce hypertensive crisis; taper clonidine to avoid rebound HTN
VASODILATORS	Hydralazine	25-100 mg/day	Divided BID	• Associated with sodium and water retention and reflex tachycardia; use with a diuretic and beta-blocker • Hydralazine associated with drug-induced lupus-like syndrome at higher doses • Minoxidil associated with hirsutism and requires a loop diuretic. Can induce pericardial effusion; need to monitor weight due to salt/water retention; should be reserved for most resistant cases of high blood pressure
	Minoxidil	2.5-80 mg/day	QD or divided BID	

MEDICATIONS: PRIMARY AGENTS

Drug Class/Medication	Dosing	Adverse Effects / Interactions*	Comments
Diuretics-Thiazide-Like and Thiazide-Type			
Hydrochlorothiazide [HCTZ] (Microzide®) **Capsule/Tablet: 12.5 mg** **Tablet: 25 mg, 50 mg** **$**	Initial: 12.5-25 mg PO once daily Usual dose: 12.5-50 mg once daily Max dose: 50 mg/day Renal impairment: CrCL < 30 ml/min: Do not use, generally not effective Hepatic impairment: Use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma	• Adverse reactions: hypokalemia (may be severe), hyperglycemia, glycosuria, hyperuricemia, hypercalcemia, electrolyte imbalance, hypotension, dizziness, renal impairment, impotence, photosensitivity, hypersensitivity reactions and rashes, headache, muscle cramps, arrhythmia, weakness, pancreatitis, cholestatic jaundice, diarrhea, nausea, anorexia, Stevens-Johnson syndrome, erythema multiforme and serious dermatologic conditions, necrotizing angiitis, hematologic abnormalities, glaucoma secondary angle closure, acute renal insufficiency and failure, SLE exacerbation • Drug interactions: dofetilide (contraindicated), NSAIDS, MAOI, sotalol, digoxin, methotrexate, flecainide, aminolevulinic acid topical, lithium	• Contraindications: anuria, hypersensitivity to hydrochlorothiazide or sulfonamides**, breastfeeding (dose > 50 mg/day) • Use caution in older patients, patients with diabetes, hepatic or renal impairment, hypercalcemia, hypokalemia and other electrolyte abnormalities, seizure disorder, arrhythmias, volume depletion, dyslipidemia, parathyroid disease, SLE, history of gout, history of pancreatitis, post-sympathectomy
Chlorthalidone **Tablet: 25 mg, 50mg** **$$**	Initial: 25 mg PO once every other day, as the common 12.5 mg PO daily initial dosing is confounded by unscored tablets Usual dose: 25 mg PO once every other day or 25 mg PO daily Max dose: 50 mg/day (25 mg/day in the older patients) Renal impairment: CrCL ≥ 10 mL/min: No adjustment necessary CrCL < 10 ml/min: Not recommended Hepatic impairment: Use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma	• Adverse reactions: nausea, dizziness, photosensitivity, rash, hyperuricemia, hyperglycemia, hypokalemia, electrolyte imbalance, anorexia, orthostatic hypotension, arrhythmias, pancreatitis, jaundice, anaphylaxis • Drug interactions: NSAIDS, MAOI, antiglycemics, dofetilide lithium, sotalol, digoxin, flecainide, aminolevulinic acid topical	• Contraindications: anuria, hypersensitivity to chlorthalidone or sulfonamides** • Use caution in patients with asthma, diabetes, gout, hepatic or renal impairment, hypercalcemia, dyslipidemia, hypokalemia, SLE, history of pancreatitis, arrhythmia, and hyponatremia • May be more effective in lowering SBP over a 24-hour period than hydrochlorothiazide • May be more effective at controlling resistant hypertension among patients with advanced chronic kidney disease • May be more effective at managing volume overload among patients with advanced chronic kidney disease to augment diuresis when combined with a loop diuretic than loop diuretic monotherapy

MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
DIURETICS-THIAZIDE-LIKE AND THIAZIDE-TYPE			
Metolazone **Tablet: 2.5 mg, 5 mg, 10 mg** **$$$**	Initial: 2.5-5 mg PO once daily Usual dose: 2.5-5 mg daily Max: 5mg/day Renal impairment: No adjustment needed, if severe, caution advised Hepatic impairment: Use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma	• Adverse reactions: orthostatic hypotension, syncope, hyperuricemia, hypercalcemia, hypokalemia, electrolyte imbalance, muscle cramps, acute renal insufficiency, anorexia, headache, diarrhea or constipation, hyperglycemia, dizziness, fatigue, hypersensitivity reactions, blood dyscrasias, hepatitis, photosensitivity, rash and pruritis, cholestatic jaundice, arrhythmias, pancreatitis, Stevens-Johnson syndrome and serious dermatologic conditions, erythema multiforme, necrotizing angiitis, SLE exacerbation • Drug interactions: lithium, aminolevulinic acid topical, dofetilide, NSAIDS, MAOI, sotalol, digoxin, flecainide	• Contraindications: anuria, hypersensitivity to metolazone, hepatic coma or pre-coma • Use with caution in patients with sulfonamide hypersensitivity • Use caution in the older patients, patients with diabetes, gout, hepatic or renal impairment, volume depletion, arrhythmias, hypokalemia, SLE, sensitivity to sulfonamides, history of pancreatitis, post-sympathectomy, seizures

Bold = Formulary *See prescribing information for complete description of dosing, adverse effects, and drug interactions. The cost scale $-$$$$$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

**Sulfonamide ("sulfa") allergy: The FDA-approved product labeling for many medications containing a sulfonamide chemical group includes a broad contraindication in patients with a prior allergic reaction to sulfonamides. Although thiazide diuretics are sulfonamide derivatives, sulfonamide cross-sensitivity has been rarely documented. Until further data are available, thiazide diuretics should be used with caution in patients with sulfonamide hypersensitivity. Thiazide diuretics do not contain the N4-aromatic amine or the N1-substituent which are present in sulfonamide antibiotics. Non-arylamine sulfonamide derivatives, such as thiazide diuretics, have been proposed to have a lower risk of allergic reactions in patients with sulfonamide allergy, presumably due to lack of an arylamine group at the N4 position (a proposed structural site of action for sulfonamide allergy).

MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS/ MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
RENIN-ANGIOTENSIN SYSTEM INHIBITORS • **Black Box Warning**: Fetal toxicity, pregnancy category D. When pregnancy is detected, discontinue ACEi as soon as possible. Drugs that act directly on the renin-angiotensin system can cause injury and death to the developing fetus. • Do not use ACEi and ARB together • Less antihypertensive effects in Black than non-Black patients			
ANGIOTENSIN-CONVERTING ENZYME INHIBITORS (ACEI)			
Enalapril (Vasotec®) **Tablet: 2.5 mg, 5mg, 10 mg, 20 mg** **$**	Initial: 5 mg PO once daily; 2.5 mg PO once daily if on diuretic, hypovolemia, hyponatremia, moderate-severe CHF Usual dose: 5-40 mg/day in 1-2 divided doses Max: 40 mg/day Renal impairment: CrCl ≤ 30 ml/min: Initial dose 2.5 mg once daily HD: 2.5 mg after dialysis, on dialysis days	• Adverse effects: dizziness, hypotension, headache, fatigue, cough, hyperkalemia, photosensitivity, hyperuricemia, Stevens-Johnson syndrome, head/neck/intestinal angioedema, hepatotoxicity, pancreatitis, increased BUN and SCr • Drug interactions: potassium-sparing diuretics, potassium supplements, hypoglycemic agents, NSAIDS, ARBs, aliskiren, lithium, azathioprine, allopurinol, pregabalin, trimethoprim, sacubitril	• Contraindications: pregnancy, idiopathic or hereditary angioedema; angioedema related to treatment with ACEi, hypersensitivity to enalapril or an ACEi, concomitant use with aliskiren in patients with diabetes, concomitant use with sacubitril • Use caution in patients with renal artery stenosis, moderate-severe renal impairment, older patients, Black, volume depletion, hyponatremia, hypotension, HF, aortic stenosis, hypertrophic cardiomyopathy, CAD, aortic stenosis, cerebrovascular disease, collagen vascular disease • Monitor renal function and potassium levels
Lisinopril (Prinivil®, Zestril®) **Tablet: 2.5 mg, 5 mg, 10 mg, 20 mg, 40 mg** **$**	Initial: 10 mg PO once daily; 5 mg PO once daily if on diuretic Usual dose: 10-40 mg once daily Max dose: 80 mg/day Renal impairment: CrCl 10-30ml/min: Initial dose 5 mg once daily; max 40 mg/day CrCl < 10 ml/min or HD: Initial dose 2.5 mg once daily; max 40 mg/day	• Adverse effects: dizziness, hypotension, syncope, headache, URI, cough, fatigue, abdominal pain, photosensitivity, hyperuricemia, head/neck/intestinal angioedema, hyperkalemia, pancreatitis, increased BUN and SCr • Drug interactions: potassium-sparing diuretics, potassium supplements, hypoglycemic agents, NSAIDS, ARBs, aliskiren, lithium, azathioprine, allopurinol, pregabalin, trimethoprim, sacubitril	• Contraindications: pregnancy, idiopathic or hereditary angioedema; angioedema related to treatment with ACEi, hypersensitivity to lisinopril or another ACEi, concomitant use with aliskiren in patients with diabetes, concomitant use with sacubitril • Use caution in patients with aortic stenosis, CVA, hypertrophic cardiomyopathy, ischemic heart disease, renal impairment, renal artery stenosis, collagen vascular disease, cerebrovascular disease, older patients, Black patients • Monitor renal function and potassium levels

Bold = Formulary *See prescribing information for complete description of dosing, adverse effects, and drug interactions. The cost scale $-$$$$$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
ANGIOTENSIN RECEPTOR BLOCKERS (ARB) ARBs are as effective as ACEi in hypertension with fewer adverse effects but cost significantly more			
Candesartan (Atacand®) Tablet: 4 mg, 8 mg, 16 mg, 32 mg $$$-$$$$	Initial: 16 mg PO once daily; 8 mg PO once daily if on diuretic Usual dose: 8-32 mg/day in 1-2 divided doses Max dose: 32 mg/day CHF Class II-IV: Initial dose: 4 mg/day, increase q 2 weeks Renal impairment: Mild-moderate: 8 mg/day Severe/HD: ≤ 8 mg/day Hepatic impairment: Moderate: Initial dose 8 mg/day; Severe: not studied	• Adverse effects: angioedema, severe hypotension (especially CHF patients), headache, dizziness, hyperkalemia, back pain, pharyngitis, rhinitis, upper respiratory infection, changes in renal function, acute renal insufficiency and failure, rhabdomyolysis, hepatitis, leuko and neutropenia, elevated hepatic enzymes • Drug interactions: NSAIDs, lithium, potassium-sparing diuretics, ACEi, aliskiren (contraindicated in patients with diabetes), MAOIs, potassium supplements, eplerenone, digoxin, clofarabine, lofexidine	• Contraindications: hypersensitivity to ARBs, pregnancy, concomitant use with aliskiren in patients with diabetes • Use caution in patients with HF, hepatic or renal impairment or renal artery stenosis • Monitor renal function and potassium levels • Unlike ACEis, ARBs are much less likely to cause cough • Less antihypertensive effects in Black than non-Black patients
Losartan (Cozaar®) **Tablet: 25 mg, 50 mg, 100 mg** **$**	Initial: 50 mg PO once daily; 25 mg PO once daily if on diuretic**;** increase dose weekly if needed Usual dose: 25-100 mg/day in 1-2 divided doses Max dose: 100 mg/day CHF with reduced EF: Initial dose: 25-50mg Renal impairment: no adjustment needed; in volume depleted patient's initial dose: 25mg/day Hepatic impairment: Initial dose: 25 mg/day	• Adverse effects: angioedema, anaphylaxis, severe hypotension (especially CHF patients), headache, nausea, dizziness, pharyngitis, diarrhea, myalgia, insomnia, fatigue, sinusitis, hyperkalemia, hepatitis, acute renal insufficiency and failure, cough, musculoskeletal pain, chest pain, asthenia, URI symptoms, dyspepsia, rhabdomyolysis • Drug interactions: NSAIDs, lithium, potassium-sparing diuretics, ACEis, aliskiren (contraindicated in patients with diabetes), MAOIs, potassium supplements, eplerenone, digoxin, rifampin, fluconazole, phenobarbital, clofarabine, lofexidine	• Contraindications: hypersensitivity to ARBs, pregnancy, concomitant use with aliskiren in patients with diabetes • Use caution in patients with HF, hepatic impairment, renal artery stenosis, hyperkalemia, hyponatremia, hypovolemia • Monitor renal function and potassium levels • Unlike ACEis, ARBs are much less likely to cause cough • Less antihypertensive effects in Black than non-Black patients • **Recommended use criteria**: Documented failure or intolerance to ACEi or for patients already controlled on ARB

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MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
ANGIOTENSIN RECEPTOR-NEPRILYSIN INHIBITOR (ARNI) ARNi use is indicated for HF as part of GDMT.			
Sacubitril-valsartan (Entresto®) Tablet: 24mg-26mg, 49mg-51mg, 97mg-103mg $$$$	Initial: 24mg-26mg BID, double the dose as tolerated in 2-4 week intervals to achieve target maintenance dose of GDMT Usual dose: 97mg-103mg BID Max dose: 97mg-103mg BID Renal impairment: no adjustment needed if eGFR ≥ 30 mL/min Hepatic impairment: not recommended for Child-Pugh class C	• Adverse effects: angioedema, anaphylaxis, severe hypotension (especially CHF patients), headache, nausea, dizziness, pharyngitis, diarrhea, myalgia, insomnia, fatigue, sinusitis, hyperkalemia, hepatitis, acute renal insufficiency and failure, cough, musculoskeletal pain, chest pain, asthenia, URI symptoms, dyspepsia, rhabdomyolysis • Drug interactions: NSAIDs, lithium, potassium-sparing diuretics, ACEis, aliskiren (contraindicated in patients with diabetes), MAOIs, potassium supplements, eplerenone, digoxin, rifampin, fluconazole, phenobarbital, clofarabine, lofexidine	• Contraindications: history of angioedema, pregnancy • Use caution in patients with HF, hepatic impairment, renal artery stenosis, hyperkalemia, hyponatremia, hypovolemia • Monitor renal function and potassium levels • Unlike ACEis, ARBs are much less likely to cause cough • Non-formulary with use criteria for HFrEF New York Heart Association Class II-III
CALCIUM CHANNEL BLOCKERS (CCB)			
DIHYDROPYRIDINES: Higher incidence of peripheral edema than non-dihydropyridines			
Amlodipine (Norvasc®) **Tablet: 2.5 mg, 5 mg, 10 mg** **$**	Initial: 5 mg PO once daily; 2.5 mg PO once daily if small, fragile, or older patients; increase dose after 7-14 days if needed Usual dose: 2.5-10 mg once daily Max dose: 10 mg/day Renal impairment: no adjustment needed Hepatic impairment: initial dose 2.5 mg/day	• Adverse effects: peripheral edema, fatigue, abdominal pain, nausea, somnolence, headache, flushing, dyspnea, palpitations, dizziness, reflex tachycardia, gingival hyperplasia, hypotension-may be acute, nausea, eczema (especially in chronic use or older patients), rash, pruritus • Increased angina and/or MI has occurred with initiation or dosage titration, hepatitis, hypersensitivity reactions and erythema multiforme • Drug interactions: codeine, methadone, oxycodone, hydrocodone, simvastatin, cyclosporine, tacrolimus, sildenafil, carbamazepine, phenytoin, rifamycins, MAOIs, azole antifungals, macrolide antibiotics, protease inhibitors, dantrolene, diltiazem and verapamil, St. John's Wort, primidone, lofexidine • Food Interaction: grapefruit juice. Monitor closely with concurrent use	• Contraindications: hypersensitivity to amlodipine or other dihydropyridines • Use with caution in older adults, CHF, patients with severe aortic stenosis, severe obstructive coronary disease, severe hepatic impairment • NOTE: Cisapride has been withdrawn from the market and is only available by an investigational limited access program for patients meeting strict inclusion criteria

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MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
CALCIUM CHANNEL BLOCKERS (CCB)			
DIHYDROPYRIDINES: Higher incidence of peripheral edema than non-dihydropyridines			
Nifedipine (Adalat CC®, Procardia XL®) **Tablet (XL): 30 mg, 60 mg, 90 mg** Tablet (CC): 30 mg, 60 mg, 90 mg **$-$$**	Initial: 30 mg PO once daily; increase dose after 7-14 days if needed Usual dose: 30-60 mg once daily Max dose: 120 mg/day (XL) 90 mg/day (CC) CC: Take on an empty stomach; 1 hour before or 2-3 hours after eating Renal impairment: no adjustment needed Hepatic impairment: not studied, use caution Do not cut, crush or chew Taper dose to D/C	• Adverse effects: peripheral edema, CHF, palpitations and arrhythmia, pulmonary edema, flushing, reflex tachycardia, nausea, dizziness, headache, nervousness, hypotension, fatigue/weakness, elevated liver enzymes, GI obstruction/ulcers (XL form), cholestasis, Steven-Johnson syndrome, muscle cramps, dyspnea, nasal congestion, gingival overgrowth, eczema (especially in chronic use or older adults) • Increased angina and/or MI has occurred with initiation or dosage titration • Drug interactions: cyclosporine, tacrolimus, digoxin, clopidogrel, lacosamide, carbamazepine, phenytoin, phenobarbital, rifamycins, MAOIs, azole antifungals, macrolide antibiotics, protease inhibitors, flecainide, nafcillin, rifampin, verapamil, St. John's Wort, lofexidine, dantrolene, secobarbital, butalbital, butabarbital, primidone • Food Interaction: grapefruit. Do not eat grapefruit or drink grapefruit juice while taking this medication	• Contraindications: hypersensitivity to nifedipine or other dihydropyridines, galactose intolerance, and IR formulations contraindicated to manage hypertensive crisis and essential HTN • Use with caution in HF or severe aortic stenosis, severe left ventricular dysfunction, renal impairment, severe hepatic impairment, hypertrophic cardiomyopathy, concomitant therapy with β-blocker or digoxin, edema, or recent D/C of β-blocker • Avoid ER /XL tabs in patients with stricture/narrowing of GI tract, or GI hypomotility

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MEDICATIONS: PRIMARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
CALCIUM CHANNEL BLOCKERS (CCB)			
Non-Dihydropyridines • Cause less vasodilation and more cardiac depression than dihydropyridine CCBs; can cause reductions in heart rate & contractility			
Diltiazem (Cardizem, Cardizem CD®, Dilt CD) **Tablet (IR): 60 mg, 90 mg** **Capsule (ER-24hr): 120 mg, 180 mg, 240 mg, 300 mg**, 360 mg (NF) **$-$$**	Initial (ER-24h): 180-240 mg PO once daily, adjust after 14 days Usual dose (ER-24h): 240-360 mg once daily Max dose: 480 mg/day Renal impairment: no adjustment needed Hepatic impairment: Consider using lower doses ER cap/tab: Swallow whole. Do not cut, crush, chew, or dissolve	• Adverse effects: headache, constipation, peripheral edema, fatigue, rhinitis, pharyngitis, dyspepsia, myalgia, dizziness, asthenia, heart block, rash, bradycardia, arrhythmias, syncope, elevated liver enzymes, acute liver injury, hypotension-may be severe, CHF, serious dermatologic conditions, gingival hyperplasia • Drug interactions: flobanserin, eliglustat, lomitapide, simvastatin, lovastatin, atorvastatin, β-blockers, digoxin, amiodarone, lithium, buspirone, carbamazepine, rifampin, phenobarbital, butalbital, butobarbital, pentobarbital, codeine, morphine, fentanyl, hydrocodone, buprenorphine, meperidine, tramadol, methadone, lofexidine, cyclosporine, tacrolimus, theophylline, clonidine, dantrolene, verapamil, felodipine, ergotamine, primidone, colchicine, phenytoin, ranolazine, erythromycin, clarithromycin, MAOIs, antiarrhythmics, protease inhibitors, azole antifungals, amlodipine, flecainide, guanfacine, nafcillin, St. John's Wort, clopidogrel, lurasidone, thioridazine	• Contraindications: hypersensitivity to diltiazem, sick sinus syndrome (without pacemaker); 2nd or 3rd degree AV block; severe hypotension (SBP < 90), acute MI and pulmonary congestion, afib/flutter associated with accessory bypass tract (IV form), V-Tach (IV form), concomitant use of colchicine, flobanserin, lomitapide, eliglustat • Avoid use in patients with HFrEF, cardiac conduction defects • Use caution in left ventricular dysfunction, hepatic or renal dysfunction • IR tablets not FDA approved for HTN

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MEDICATIONS: SECONDARY AGENTS

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
LOOP DIURETICS More effective than thiazides in lowering BP in patients with moderate to severe renal insufficiency (CrCl < 30 ml/min)			
Furosemide (Lasix®) **Tablet: 20 mg, 40 mg** **INJ: 10 mg/ml** **$**	Initial: 20-40 mg PO twice daily Usual dose: 20-80 mg/day divided in 2 doses Max: 600 mg/day Renal or hepatic impairment: No adjustment needed; caution advised for cirrhosis/ascites	• Adverse reactions: hyperuricemia, hypercalcemia, hypokalemia, hypomagnesemia, electrolyte imbalance, metabolic alkalosis, muscle cramps, hyperglycemia, loss of appetite, nausea/vomiting, pruritis, blurred vision, abdominal cramps, diarrhea, bladder spasm, polyuria and urinary frequency, tinnitus and hearing loss, dizziness, hypersensitivity reactions, anaphylaxis, cholesterol and triglycerides increased, elevated liver enzymes, photosensitivity, blood dyscrasias, hypovolemia, acute renal insufficiency and failure, rash/severe dermatologic conditions, pancreatitis and cholestatic jaundice, vasculitis, SLE exacerbation, nephrolithiasis (chronic use), thrombosis, paresthesia's • Drug interactions: desmopressin, aminoglycosides, ethacrynic acid, lithium, cisplatin, ARBs, ACEis, sucralfate, chloral hydrate, phenytoin, ritonavir, cephalosporins, cyclosporine, NSAIDs, MAOIs, amikacin, lofexidine, probenecid, neomycin, foscarnet, clofarabine	• **Black Box Warning**: If given in excessive amounts, furosemide can lead to profound dieresis resulting in fluid & electrolyte depletion • Contraindications: anuria, hypersensitivity to furosemide, hepatic coma, electrolyte imbalances, concomitant use of desmopressin • Use caution in older adults, in cirrhosis, diabetes, prostatic hyperplasia/urinary stricture/urinary retention, SLE, concomitant ototoxic drugs (e.g., aminoglycosides, ethacrynic acid), sensitivity to sulfonamides, arrhythmias, iodinated contrast dye, hepatic and renal disease

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MEDICATIONS: SECONDARY AGENTS CONT'D

DRUG CLASS/ MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
POTASSIUM SPARING DIURETICS			
Triamterene/HCTZ (Dyazide®, Maxzide®) **Capsule: 37.5/25 mg** **Tablet:** 37.5/25 mg, **75/50 mg** **$**	Initial: 37.5/25 mg PO once daily Usual dose: 37.5/25 mg to 75/50 mg once daily Max dose: 75/50 mg/day Renal impairment: AVOID CrCl < 30 ml/min: Do not use (contraindicated) Hepatic impairment: Use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma	• Adverse reactions: hyperkalemia, shortness of breath, orthostatic hypotension, dizziness, electrolyte imbalance, muscle cramps, anorexia, nausea/vomiting, taste changes, impotence, blurred vision, hyperglycemia, hepatic coma, acute renal failure, angle-closure glaucoma, drowsiness and fatigue, tachycardia, kidney stones, hypercalcemia, hyperuricemia, dyslipidemia, hypersensitivity reactions, photosensitivity, anaphylaxis, arrhythmias, pancreatitis, intrahepatic cholestatic jaundice, severe dermatologic conditions, hematologic abnormalities, SLE exacerbation, DM, headache, asthenia • Drug interactions: lithium, dofetilide, amiloride, spironolactone, eplerenone, digoxin, NSAIDs, trimethoprim, ACEis, ARBs, MAOIs, lofexidine, clofarabine, aminolevulinic acid topical, methotrexate, desmopressin, cyclosporin	• **Black Box Warning**: Abnormal elevation of serum potassium levels (≥ 5.5 mEq/L) can occur. Risk of hyperkalemia is increased in patients with renal dysfunction, diabetes (with or without renal impairment), older adults, and severely ill. Since uncorrected hyperkalemia may be fatal, monitor serum potassium levels at frequent intervals especially upon initiation, when dosages are changed or with any illness that may influence renal function • Contraindications: hypersensitivity to triamterene or hydrochlorothiazide, pregnancy, breastfeeding hyperkalemia, antikaliuretic therapy or potassium supplementation, anuria, acute or chronic renal insufficiency, severe renal impairment, hypersensitivity to sulfonamides**, concomitant use of amiloride, dofetilide, eplerenone, potassium bicarbonate, additional triamterene, and spironolactone • Use caution in patients with diabetes, hepatic or renal impairment, hypercalcemia, dyslipidemia, kidney stones, parathyroid disease, SLE, seizures, volume depletion, arrhythmias, gout, Hx of pancreatitis, post-sympathectomy, electrolyte abnormalities, concurrent use of lithium

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**Sulfonamide ("sulfa") allergy: The FDA-approved product labeling for many medications containing a sulfonamide chemical group includes a broad contraindication in patients with a prior allergic reaction to sulfonamides. Although thiazide diuretics are sulfonamide derivatives, sulfonamide cross-sensitivity has been rarely documented. Until further data are available, thiazide diuretics should be used with caution in patients with sulfonamide hypersensitivity. Thiazide diuretics do not contain the N4-aromatic amine or the N1-substituent which are present in sulfonamide antibiotics. Non-arylamine sulfonamide derivatives, such as thiazide diuretics, have been proposed to have a lower risk of allergic reactions in patients with sulfonamide allergy, presumably due to lack of an arylamine group at the N4 position (a proposed structural site of action or sulfonamide allergy).

MEDICATIONS: SECONDARY AGENTS CONT'D

DRUG CLASS /MEDICATION	DOSING	ADVERSE EFFECTS / INTERACTIONS*	COMMENTS
ALDOSTERONE RECEPTOR BLOCKER			
Spironolactone (Aldactone®) **Tablet: 25 mg, 50 mg, 100 mg** **$-$$**	Initial: 25-100 mg/day PO in 1-2 divided doses; may increase dose after 2 weeks Renal impairment with CHF start: 12.5 mg/every other day or daily Usual Dose: 25-50 mg once daily Max dose: Doses > 100 mg/day generally do not provide additional reductions in blood pressure Renal impairment: CrCl <10 mL/min: Avoid use With CHF CrCl <30 mL/min: Avoid use Hepatic impairment: Per mfg. labeling—Initiate in the hospital	• Adverse reactions: gynecomastia, breast pain, diarrhea, fever, nausea, vomiting, GI bleeding, gastritis, gastric ulcer, somnolence, hyperkalemia-may be severe, hyperuricemia, electrolyte imbalance, metabolic acidosis, gout, lethargy, muscle cramps, headache, abdominal cramps, confusion, dizziness, gastritis, blood dyscrasias/agranulocytosis, rash, hypersensitivity reactions, anaphylaxis, vasculitis, renal failure, hepatotoxicity, Stevens-Johnson syndrome, severe dermatologic conditions, SLE, irregular menses, erectile dysfunction • Drug interactions: triamterene, eplerenone (contraindicated), ACEis, ARBs, heparin, lithium, corticosteroids, NSAIDs, digoxin, trimethoprim, MAOIs, amikacin, lofexidine, clofarabine, warfarin	• **Black Box Warning:** Shown to be a tumorigen in chronic toxicity animal studies. Avoid unnecessary use • Contraindications: anuria, acute renal insufficiency, CrCl < 30 if over 65 years old, Addison's disease, hyperkalemia, concomitant eplerenone, amiloride, and/or triamterene use, significant renal impairment • Use caution in patients with cirrhosis, HF, renal impairment, adrenal vein catheterization, volume depletion, diabetes, hepatic impairment, gout • May be a useful adjunct in patients with resistant HTN • Minimal effect on lowering blood pressure, but used in combination with thiazides to minimize potassium loss

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MEDICATIONS: SECONDARY AGENTS CONT'D

BETA-BLOCKERS

- **Black Box Warning:** Abrupt discontinuation of any beta-adrenergic blocking agent, particularly in patients with preexisting cardiac disease, can cause myocardial ischemia, myocardial infarction, ventricular arrhythmias, or severe hypertension
- When discontinuing therapy, beta-blockers should be gradually stopped to avoid rebound hypertension (decrease dose by 50% for 3 days and then another 50% for 3 days)

CARDIOSELECTIVE BETA-1 ANTAGONISTS

Atenolol (Tenormin®) **Tablet: 25 mg, 50 mg, 100 mg** **$**	Initial: 25-50 mg PO once daily; if inadequate response after 1 to 2 weeks, may increase to 100 mg PO once daily Usual dose: 25-100 mg once daily Max dose: 100 mg/day Renal impairment: CrCl 15 to 35 mL/min: Max dose 50 mg/day CrCl < 15 mL/min: Max dose 25 mg/day	• Adverse reactions: bradycardia, dizziness, fatigue, depression, nightmares, diarrhea, impotence, cold extremities, hypotension, fatigue, HF, chest pain, heart block, edema, nausea, vertigo, abnormal lipids, supraventricular tachycardia, dyspnea • Drug interactions: amiodarone, dronedarone, verapamil, diltiazem, clonidine, NSAIDS, digoxin, reserpine, disopyramide, MAOIs, anti-diabetic agents, α-blockers	• Contraindications: sinus bradycardia, 2nd or 3rd degree heart block, uncompensated HF, cardiogenic shock, overt cardiac failure, hypersensitivity to atenolol or any component of the product • Use caution in patients with renal impairment, bronchospastic disease, conduction abnormality, diabetes, HF, myasthenia gravis, pheochromocytoma, PAD, thyroid disease, anesthesia, and major surgery, older adults, avoid abrupt withdrawal, pregnancy, and lactation • May mask symptoms of hypoglycemia
Metoprolol Succinate (Toprol-XL®) **Tablet (ER): 25 mg, 50 mg, 100 mg, 200 mg** **INJ: 5 mg/5ml** $-$$$	Initial: 25-100 mg PO qd, may increase dose q wk. Usual dose: 50-200 mg once daily Max dose: 400 mg/day Renal impairment: no adjustment needed, give dose after dialysis Hepatic impairment: start with low doses and titrate gradually	• Adverse reactions: CHF, bradycardia, heart block, fatigue, dizziness, diarrhea, rash, pruritus, depression, sleep disturbances, gangrene, dyspnea, bronchospasm, angina • Drug interactions: celecoxib, ceritinib, clonidine, antidiabetic agents, NSAIDs, verapamil, diltiazem, rifampin, lidocaine, venlafaxine, amiodarone, dronedarone, propafenone, quinidine, fluoxetine, paroxetine, reserpine, MAOIs, α-blockers	• **CCHCS Restricted** to patients who currently have medical justification for half tablet dosing of metoprolol tartrate 25 mg (12.5 mg dose). Avoid prescribing multiple tablets to make up higher doses • Contraindications: sinus bradycardia; 2nd or 3rd degree heart block; cardiogenic shock; overt HF; sick sinus syndrome (except in patients with a functioning artificial pacemaker); severe peripheral arterial disease, hypersensitivity to metoprolol succinate or any component of the product • Use caution in patients with HF, PAD, diabetes, thyroid disorder, hepatic impairment, bronchospastic disease, myasthenia gravis, psoriasis, anesthesia, and major surgery, older adults, avoid abrupt withdrawal and pregnancy • May mask symptoms of hypoglycemia

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MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class /Medication	Dosing	Adverse Effects / Interactions*	Comments
Beta-Blockers continued			
Cardioselective Beta-1 Antagonists continued			
Metoprolol Tartrate (Lopressor®) **Tablet (IR): 25mg, 50mg, 100mg** **$-$$$**	**IR:** Initial: 50 mg PO twice daily with food Usual dose: 100-200 mg/day in 2 divided doses with food Max dose: 450 mg/day with food Renal impairment: No adjustment needed, give dose after dialysis Hepatic impairment: Initiate at low dose and titrate dose slowly	• Adverse effects: fatigue, dizziness, diarrhea, pruritus, rash, depression, dyspnea, bradycardia, sleep disturbance, nightmares, HF, heart block, gangrene, bronchospasm, photosensitivity • Drug interactions: amiodarone, dronedarone, verapamil, diltiazem, clonidine, digoxin, MAOIs, reserpine, quinidine, fluoxetine, paroxetine, propafenone, antidiabetic agents, NSAIDs, celecoxib, ceritinib, rifampin, lidocaine, venlafaxine, α-blockers	• Contraindications: sinus bradycardia; 2nd or 3rd degree heart block; cardiogenic shock; overt HF; sick sinus syndrome (except in patients with a functioning artificial pacemaker); severe PAD, hypersensitivity to metoprolol tartrate or any component of the product • Use caution in patients with hepatic impairment, bronchospastic disease, conduction abnormality, diabetes, HF, myasthenia gravis, pheochromocytoma, PAD, psoriasis, psychiatric disease, thyroid disease, history of severe anaphylactic reactions, anesthesia and major surgery, older adults, avoid abrupt withdrawal and pregnancy • May mask symptoms of hypoglycemia
Nonselective Beta-blocker			
Propranolol (Inderal® LA) **Tablet (IR): 10mg, 20mg, 40mg, 60mg** **$-$$$** **INJ: 1 mg/ml-1 ml** Capsules (ER): 60 mg, 80 mg, 120 mg, 160 mg $$-$$$	**IR:** Initial: 40 mg PO twice daily Usual dose: 120-240 mg/day divided in 2 doses Max dose: 640 mg/day **ER:** Initial: 80 mg PO once daily Usual dose: 120-160 mg once daily Max dose: 640 mg/day Renal or Hepatic impairment: No adjustment needed	• Adverse effects: bradycardia, hypotension, fatigue, vivid dreams, nausea, diarrhea, pruritis, rash, bronchospasm, hypersensitivity reactions, impotence, Peyronie's disease, cold extremities, angina, heart block, heart failure, depression • Drug interactions: amiodarone, dronedarone, verapamil, diltiazem, lidocaine, epinephrine, thioridazine, clozapine, fluoxetine, haloperidol, warfarin, digoxin, clonidine, antidiabetic agents, NSAIDs, MAOIs, α-blockers	• Contraindications: blood pressure < 50/30 mmHg, HR < 80 beats/min, decompensated HF, cardiogenic shock; sinus bradycardia, sick sinus syndrome, or heart block greater than 1st degree (except in patients with a functioning artificial pacemaker); bronchial asthma; pheochromocytoma, hypersensitivity to propranolol or any component of the product, concurrent use with thioridazine • Use caution in patients with hepatic or renal impairment, bronchospastic disease, conduction abnormality, diabetes, HF, myasthenia gravis, PAD, psoriasis, psychiatric disease, thyroid disease, older adults, avoid abrupt withdrawal and pregnancy • May mask symptoms of hypoglycemia

MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class /Medication	Dosing	Adverse Effects / Interactions*	Comments
Nonselective Beta-Blocker/Selective Alpha 1 blocker • **Black Box Warning**: Abrupt discontinuation of any beta-adrenergic blocking agent, particularly in patients with preexisting cardiac disease, can cause myocardial ischemia, myocardial infarction, ventricular arrhythmias, or severe hypertension • When discontinuing therapy, beta blockers should be gradually stopped to avoid rebound hypertension (decrease dose by 50% for 3 days and then another 50% for 3 days)			
Carvedilol (Coreg®) **Tablet (IR): 3.125 mg, 6.25 mg, 12.5 mg, 25 mg** **$**	Initial: 6.25 mg PO twice daily with food; may increase to 12.5 mg PO twice daily after 7-14 days if needed Usual dose: 6.25-25 mg twice daily with food Max dose: 25 mg twice daily with food Renal impairment: No adjustment needed Hepatic impairment: Severe: Contraindicated	• Adverse effects: dizziness, fatigue, hypotension, diarrhea, hyperglycemia, asthenia, bradycardia, weight increase, vomiting, nausea, arthralgia, visual disturbances, edema, syncope, angina, anemia, pulmonary edema, elevated hepatic enzymes, CHF, asthma, increased cough, dyspnea, erectile dysfunction, depression • Intraoperative floppy iris syndrome has been reported during cataract surgery • Drug interactions: rifampin, MAOIs, clonidine, cyclosporine, digoxin, amiodarone, verapamil, diltiazem, antidiabetic agents, quinidine, fluoxetine, paroxetine, propafenone, reserpine, NSAIDs, epinephrine, dronedarone, α1-blockers	• Contraindications: patients with severe bradycardia (except in patients with a functioning artificial pacemaker), 2nd or 3rd degree AV block, decompensated HF, requiring IV inotropic therapy, sick sinus syndrome, cardiogenic shock, bronchial asthma, severe hepatic impairment, hypersensitivity to carvedilol or any component of the product • Use caution in patients with PAD, Prinzmetal angina, bradycardia, bronchospastic disease, HF, major surgery, diabetes, thyroid disorder, WPW syndrome, psoriasis, pheochromocytoma, renal impairment, hepatic impairment, myasthenia gravis, older adults, avoid abrupt withdrawal, pregnancy, and lactation • May mask symptoms of hypoglycemia

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MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class /Medication	Dosing	Adverse Effects / Interactions*	Comments
Nonselective Beta-Blocker/Selective Alpha 1 blocker • **Black Box Warning**: Abrupt discontinuation of any beta-adrenergic blocking agent, particularly in patients with preexisting cardiac disease, can cause myocardial ischemia, myocardial infarction, ventricular arrhythmias, or severe hypertension • When discontinuing therapy, beta blockers should be gradually stopped to avoid rebound hypertension (decrease dose by 50% for 3 days and then another 50% for 3 days)			
Labetalol **Tablet: 100mg, 200mg, 300mg** **$-$$$$**	Initial: 100 mg PO twice daily; increase in increments of 100 mg PO twice daily every 2-3 days if needed Usual dose: 200-400 mg twice daily; 100-200 mg twice a day in older adults Max dose: 2400mg/day in 2-3 divided doses Renal impairment: No adjustment needed Hepatic impairment: Reduce dose by 50%	• Adverse effects: HF, hyperkalemia, hepatotoxicity, bronchospasm, hypotension, nausea, dizziness, headache, fatigue, nasal congestion, dyspnea, erectile dysfunction, psoriasis • Intraoperative floppy iris syndrome has been reported during cataract surgery • Drug interactions: amiodarone, verapamil, diltiazem, clonidine, dronedarone, halothane, cimetidine, digoxin, antidiabetic agents, nitroglycerin, MAOIs, NSAIDs, imipramine, epinephrine, α-blockers	• Contraindications: severe bradycardia; heart block > 1st degree (except in patients with a functioning artificial pacemaker); cardiogenic shock; bronchial asthma; uncompensated cardiac failure; conditions associated with severe and prolonged hypotension, hypersensitivity to labetalol or any component of the product • Use caution in patients with bronchospastic disease, conduction abnormality, diabetes, HF, hepatic impairment, myasthenia gravis, PAD, pheochromocytoma, psoriasis, psychiatric disease, thyroid disease, latent cardiac insufficiency, older adults, pregnancy avoid abrupt withdrawal • May mask symptoms of hypoglycemia

Bold = Formulary *See prescribing information for complete description of dosing, adverse effects, and drug interactions. The cost scale $-$$$$$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class / Medication	Dosing	Adverse Effects / Interactions*	Comments
Alpha-1 Adrenergic-Blockers			
Doxazosin (Cardura®) **Tablet: 1mg, 2 mg, 4mg, 8 mg** **$-$$$**	Initial: 1 mg PO once daily at bedtime; increase dose every 1-2 weeks if needed Usual dose: 1-16 mg once daily Max dose: 16 mg/day Renal impairment: no adjustment needed Hepatic impairment: Mild-moderate: use caution Severe: Avoid use	• Adverse effects: dizziness, headache, fatigue/malaise, somnolence, edema, rhinitis, dyspnea, palpitations, chest pain, nausea, diarrhea, xerostomia, blurred vision, polyuria, arrhythmias • May cause significant orthostatic hypotension and syncope, especially with first dose • Intraoperative floppy iris syndrome may occur during cataract surgery • Priapism has been associated with use (rare) • Drug interactions: PDE-5 inhibitors (e.g., sildenafil, tadalafil, vardenafil), MAOIs, verapamil, nifedipine, tamsulosin, β-blockers, midodrine	• Contraindications: hypersensitivity to doxazosin, any other component of the product, or other quinazolines (e.g., prazosin, terazosin) • Use caution in patients with HF, angina pectoris, or recent acute MI (within the last 6 months) hepatic disease, older adults, hypotension, cataract surgery, pregnancy, and breastfeeding • Discontinue if angina occurs or worsens
Terazosin **Capsule: 1 mg, 2 mg, 5mg, 10 mg** **$**	Initial: 1 mg PO once daily at bedtime; increase dose gradually over several weeks if needed Usual dose: 1-5 mg/day may divide doses BID Max dose: 20 mg/day Use with concomitant medications: When adding a diuretic or other antihypertensive, decrease terazosin dose and re-titrate Discontinuation or interruption of therapy for several days or longer, restart use at the initial dose Renal impairment: no adjustment needed Hepatic impairment: No specific recommendations available	• Adverse effects: dizziness, headache, asthenia, nasal congestion, peripheral edema, somnolence, nausea, pain, dyspnea, paresthesia, sinusitis, nervousness, tachycardia, palpitations, atrial fibrillation, anaphylaxis • May cause significant orthostatic hypotension and syncope, especially with first dose • Intraoperative floppy iris syndrome may occur during cataract surgery • Priapism has been associated with use (rare) • Drug interactions: PDE-5 inhibitors (e.g., sildenafil, tadalafil, vardenafil), MAOIs, β-blockers, verapamil, nifedipine, midodrine	• Contraindications: hypersensitivity to terazosin, any other component of the product, or other quinazolines (e.g., doxazosin, prazosin) • Use caution in the following patients: older adults, HF, angina, pregnant or breastfeeding, hypotension, cataract surgery • Discontinue if angina occurs or worsens • Risk of syncope greatest during initial week of treatment, but risk continues throughout

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MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class / Medication	Dosing	Adverse Effects / Interactions*	Comments
Central Alpha-2 Adrenergic Agonist			
Clonidine (Catapres®, Catapres TTS®) **Tablet: 0.1 mg, 0.2 mg, 0.3 mg** Patch: 0.1 mg/24 h, 0.2 mg/24 h, 0.3 mg/24 h **$ - Tablets** $$$-$$$$$ - Patches	**Tablets** Initial: 0.1mg PO twice daily; increase by 0.1 mg/day at weekly intervals until desired effect achieved; consider lower start dose in older patients Usual dose: 0.2-0.8 mg/day in 2 divided doses Max dose: 2.4 mg/day **Patch** Initial: Apply 0.1 mg/24 h patch to upper arm or torso once every 7 days; increase by 0.1 mg/24 h patch increments every 1-2 weeks as needed Max dose: 0.6 mg/24 h every 7 days Renal impairment: Use lower initial dose Hepatic Impairment: Clonidine is substantially metabolized by the liver, monitor patients for sedation and hypotension and adjust the dose if necessary	• Adverse effects: somnolence, headache, hypotension, orthostatic hypotension, increased body temperature, xerostomia, abdominal pain, fatigue, nightmares, nausea, URI, irritability, throat pain, insomnia, confusion, dizziness, sedation, constipation, diarrhea, sexual dysfunction, syncope, bradycardia, AV block, nasal congestion, urinary incontinence • Drug interactions : TCAs, digoxin, diltiazem, verapamil, β-blockers, MAOIs, mirtazapine, CNS depressants, cyclosporine, naloxone	• **Black Box Warning:** Appropriate Use: dilute 500 mcg/mL strength product prior to use in an appropriate solution. Obstetrical, Postpartum, or Perioperative Use: weigh risk/benefit; epidural clonidine generally not recommended for obstetrical, postpartum, or perioperative pain management due to risk of hemodynamic instability, especially hypotension and bradycardia • Contraindications: hypersensitivity to clonidine or any other component of the product; epidural administration in patients receiving anticoagulant therapy, bleeding diathesis, injection site infection or administration above the C4 dermatome • Use caution in patients with recent MI, cerebrovascular disease, chronic renal insufficiency, severe coronary insufficiency, or conduction disturbances, older adults, dehydration, history of depression, alcohol use, pregnancy, or lactation • Do not discontinue clonidine abruptly. Reduce dose gradually over 2-4 days to prevent rebound hypertension, nervousness, agitation, and headache • Patients on both β-blocker and clonidine where discontinuation of clonidine is necessary, withdraw the β-blocker several days before gradual discontinuation of clonidine • Oral doses above 1.2 mg/day may not provide additional benefit • Antihypertensive effect of patches may take 2-3 days after initial application • Clonidine is often used for treatment of hypertensive urgencies

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MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class / Medication	Dosing	Adverse Effects / Interactions*	Comments
Central Alpha-2 Adrenergic Agonist			
Guanfacine **Tablet (IR): 1 mg, 2 mg** **$-$$$**	Initial: 1 mg PO daily at bedtime; increase to 2 mg after 3-4 weeks, then 3 mg after an additional 3-4 weeks if needed NOTE: Most of the clinical effect will be seen at the 1 mg dose Usual dose: 1-2 mg once daily Max dose: 3 mg/day Renal impairment: CrCl < 30 ml/min: use lower doses Hepatic Impairment: Use with caution, dose adjustment may be necessary	• Adverse effects: xerostomia, somnolence, headache, dizziness, constipation, fatigue, exfoliative dermatitis, syncope, bradycardia • Drug interactions: CNS depressants, phenobarbital, phenytoin, β-blockers, TCAs, mirtazapine, MAOIs	• Contraindications: hypersensitivity to guanfacine or any other component of the product • Use caution in patients with recent MI, cerebrovascular disease, severe coronary insufficiency, history of bradycardia, heart block, hypotension, or syncope, chronic renal or hepatic failure, older adults, CAD, pregnancy, or lactation • Abrupt discontinuation of guanfacine may lead to anxiety, nervousness, or hypertension. Decrease the dose over several days • Increased adverse effects with doses above 3mg/ day
Direct Vasodilators			
Hydralazine **Tablet: 25 mg, 50 mg** **$**	Initial: 10 mg PO 4 times per day for 2-4 days; then increase to 25 mg PO 4 times per day for the remainder of week 1, then may increase to 50 mg 4 times per day Usual dose: 100-200 mg/day in 4 divided doses Max dose: 300 mg/day Renal impairment: CrCl 10-50 mL/min: administer every 8 hours CrCl < 10 ml/min: dosing interval may be extended to 8-16 hours Hepatic Impairment: No specific recommendations available, however, hydralazine undergoes extensive hepatic metabolism.	• Adverse effects: headache, tachycardia, angina, palpitations, nausea, vomiting, diarrhea, MI, hypotension, neutropenia, blood dyscrasias, lupus-like syndrome, peripheral neuropathy, edema, loss of appetite, dizziness, pruritus, rash • Drug interactions: thioridazine, clonidine, lofexidine, MAOIs, NSAIDs, levodopa	• Contraindications: patients with CAD or mitral valve rheumatic heart disease, hypersensitivity to hydralazine or any other component of the product • Use caution in patients with severe renal disease, CVAs, mitral valvular disease, older adults, hypertrophic cardiomyopathy, hypotension, SLE, pregnancy • Incidence of SLE higher in patients on higher doses (> 200 mg/day) • Usually administered with diuretic and β-blocker to counteract sodium and water retention and reflex tachycardia

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MEDICATIONS: SECONDARY AGENTS CONT'D

Drug Class / Medication	Dosing	Adverse Effects / Interactions*	Comments
Direct Vasodilators			
Minoxidil **Tablet:** **2.5 mg, 10 mg** **$-$$$**	Initial: 5 mg/day PO once daily 2.5 mg PO once daily in older adults; increase dose gradually every 3 days Usual dose: 10-40 mg/day in 1-2 divided doses Max dose: 100 mg/day Renal impairment: CrCl 10-50 ml/min: extend dosing interval to 24 hours CrCl < 10ml/min: not recommended Hepatic Impairment: No specific recommendations available, use with caution and titrate gradually	• Adverse effects: tachycardia, angina, marked fluid retention, pericardial effusion, pericarditis, weight gain, headache, edema, tamponade, hair growth on face and body, CHF, Stevens-Johnson syndrome, rash, nausea • Drug interactions: lofexidine, MAOIs, NSAIDs, cyclosporine	• **Black Box Warnings**: Appropriate Use: Administer under close supervision usually in combination with therapeutic doses of beta-blocker to prevent tachycardia and increased myocardial workload; typically prescribed with loop diuretic to prevent serious fluid accumulation; hospitalize patients with malignant HTN and if concomitant guanethidine for initial treatment, monitor to avoid too rapid or large orthostatic decrease in blood pressure. Serious Cardiac Event Risk: Powerful antihypertensive with serious adverse event risk including pericardial effusion sometimes progressing to tamponade and angina pectoris exacerbation; reserve for HTN patients without adequate response to max therapeutic dose of diuretic and 2 other antihypertensives • Contradictions: patients with pheochromocytoma, pericardial effusion, hypersensitivity to minoxidil or any other component of the product • Use caution in patients with, renal failure, older adults, cardiac disease, MI, CHF, tachycardia, cerebrovascular disease, pregnancy • Avoid use of minoxidil for 1 month after acute MI • Usually administered with diuretic and β-blocker to counteract sodium and water retention and reflex tachycardia • Minoxidil should be reserved for severe hypertension refractory to other drugs.

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MONITORING

Appropriate follow-up and monitoring enable assessment of adherence and response to therapy, help identify adverse responses to therapy and TOD, and allow assessment of progress toward treatment goals. Patients on a new or adjusted antihypertensive regimen should have monthly follow-up until BP control is achieved. More frequent nurse visits may be needed for the following patients:

- Initial BP ≥ 160/100 mmHg
- Presented with hypertensive urgency or emergency
- Older adults (age ≥ 65 yo) or other patients who are prone to hypotension

Once BP target is achieved and stable, follow-up can occur every 3-6 months. Monitoring involves:

- Repeat BP measurement to assess response to therapy
- Detection of orthostatic hypotension in older patients or those with postural symptoms
- Identification of white coat effect
- Documentation of adherence to therapy or drug-associated side effects
- Documentation of adverse effects
- Reinforcement of therapeutic lifestyle intervention and medication adherence
- Adjustment of medication dosage, if clinically indicated
- Laboratory testing, such as CMP for electrolytes, renal function, and other assessment for TOD

If the patient presents with symptoms and/or signs of target organ damage (TOD) in the setting of SBP ≥ 180 mmHg or DBP ≥ 120 mmHg, transfer patient to higher level of care (HLOC).

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Reference articles available upon request to m_CDADS@cdcr.ca.gov

PATIENT EDUCATION/SELF-MANAGEMENT

Blood Pressure and Hypertension: What You Should Know

WHAT IS BLOOD PRESSURE?

- Blood pressure is a measure of how hard the blood pushes against the walls of your arteries.

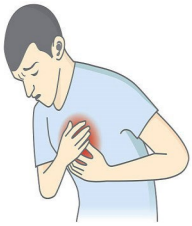
WHAT IS HIGH BLOOD PRESSURE?

- Another name for high blood pressure is hypertension.
- Blood pressure that is too high when you are at rest.

WHAT IS WRONG WITH HAVING HIGH BLOOD PRESSURE?

When blood pressure is high, it starts to damage the blood vessels, heart, kidneys, and eyes. Over time this high blood pressure can lead to:

- Heart attacks
- Strokes
- Blindness
- Kidney failure requiring dialysis
- Death



HOW IS HIGH BLOOD PRESSURE DIAGNOSED?

- Blood pressure consists of two numbers measured with a blood pressure cuff and stethoscope.
- These numbers are called **systolic** (pronounced si-stol-ik) pressure and **diastolic** (pronounced dahy-uh-stol-ik) pressure.
- The **systolic** number is how hard the blood pushes on the blood vessels when the heart is pumping. It is the top number and is the higher value of the two.
- The **diastolic** number is how hard the blood is pushing on the blood vessels between heartbeats. It is the bottom number and is the lower value of the two.
- You won't know if you have high blood pressure until it is checked by your medical team.
- High blood pressure is called a "silent killer" because it doesn't usually cause symptoms while it is causing damage to your body.
- The higher the numbers are, the more serious the concern for hypertension and risk of death.
- Go over the chart below with your medical team to make sure you understand high blood pressure.

BLOOD PRESSURE STAGES

Blood Pressure Category	**Systolic mmHg** ***(Top #)***		**Diastolic mmHg** ***(Bottom #)***
Normal	119 or below	And	79 or below
At Risk	120-139	And	80-89
High	140 or higher	Or	90 or higher

HOW IS HIGH BLOOD PRESSURE TREATED?

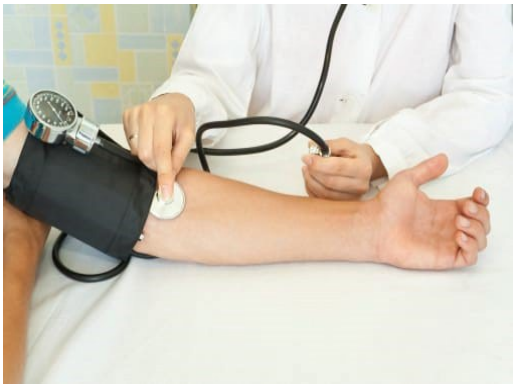
- **Medications:** There are many medications that can treat high blood pressure. Talk about your options with your medical team.
- **Lifestyle Changes:** There are also things you can do to help treat high blood pressure like exercise and eat healthy.

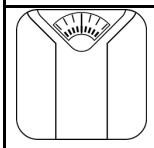
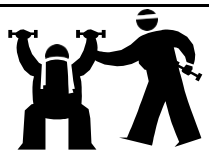
PATIENT EDUCATION/SELF MANAGEMENT

Hypertension: What Should You Do?

Tips for having your blood pressure taken:

- ✓ Wear short sleeves so your arm is exposed.
- ✓ Don't drink coffee or smoke cigarettes 30 minutes before having your blood pressure measured.
- ✓ Avoid vigorous physical activity before your appointment.
- ✓ Go to the bathroom prior to the reading. A full bladder can change your blood pressure reading.
- ✓ Before the test, sit for five minutes with your back supported and your feet flat on the ground. Rest your arm on a table at the level of your heart.
- ✓ Ask the doctor or nurse to tell you the blood pressure reading numbers.



What your health care team will follow	How will you help yourself?
 Blood Pressure today:_____/_____ Blood Pressure last visit:____/_____	Discuss your current and past blood pressure levels with your Primary Care Provider (PCP).
 Weight_____lbs Is this a healthy weight for me? Yes / No	Discuss your weight with your PCP.
 Is it safe for me to start doing regular physical activity? Yes / No	Discuss recommended physical activity with your PCP.
Are there any foods, beverages, or other things I should avoid when my blood pressure is high?	✓ Avoid salt or foods high in salt (sodium) ✓ Caffeine may elevate blood pressure ✓ Avoid alcohol and quit smoking

Know Your Medication	Tips to Help You Remember to Take Your Blood Pressure Medications
What is the name of my blood pressure medication? _____ What are the possible side effects of my medication? _____ What should I do if I forget to take my blood pressure medicine at the recommended time? Should I take it as soon as I remember, or should I wait until the next dosage is due? _____ _____	• Take your medications at the same time every day. Try to do it with something else that you do regularly, like brushing your teeth or eating a meal. • Try keeping a chart or calendar to write down when you take your medication. This is really helpful if you take more than one medication. • Each time you pick up a refill, make a note on your calendar to order and pick up the next refill one week before the medicine is due to run out. Remember to pick up your prescription every month. It will be automatically refilled as long as the prescription is active.

PATIENT EDUCATION/SELF MANAGEMENT

Hypertension: What You Should Know

Maintain a Healthy Weight

- Being overweight increases your risk of developing high blood pressure and makes it harder to treat.
- Losing even 10 pounds can lower blood pressure.
- Discuss your weight with your health care team.

Exercise

- Being physically active is one of the most important steps you can take to prevent or control high blood pressure.
- Do an aerobic activity like walking at least 30 minutes five days a week.

Reduce Sodium (Salt) in Your Diet

- We all need a small amount of sodium to keep our bodies working well, but most of us consume way too much.
- High salt diets can raise your blood pressure, which may cause heart disease or a stroke.
- Do not add salt to your food.
- Try to avoid foods with added salt especially items from the canteen like salted nuts or chips and other processed foods.
- When salt intake is lowered, blood pressure levels can lower within weeks.

Eat more fruits and vegetables

Cut down on caffeine

Don't smoke!

Take your medications as directed

- Talk to your medical provider if you are having problems with a medication.
- Do not stop your medication without discussing it with your health care team.

Know your numbers

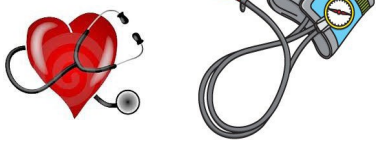
- Ask your doctor what your blood pressure values are at each visit and how those compare to past visits.
- Talk to your health care team about what you can do to help lower your blood pressure.

EDUCACION PARA ED PACIENTE/CONTROL PERSONAL DEL CASO

PRESIÓN ARTERIAL E HIPERTENSIÓN: lo que debe saber

¿QUÉ ES LA PRESIÓN ARTERIAL?

- La presión arterial es la medida de la fuerza con la que la sangre empuja las paredes de las arterias.

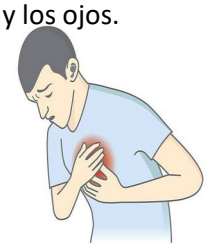


¿QUÉ ES LA PRESIÓN ARTERIAL ALTA?

- A la presión arterial alta también se le conoce como hipertensión.
- La presión arterial es muy alta cuando usted está en reposo.

¿CUÁL ES EL PROBLEMA DE TENER PRESIÓN ARTERIAL ALTA?

Cuando la presión arterial es alta comienza a dañar los vasos sanguíneos, el corazón, los riñones y los ojos.
Con el tiempo, la presión arterial alta puede provocar:



- Ataques cardiacos
- Derrames cerebrales
- Ceguera
- Fallo renal que requiera diálisis
- Muerte

¿CÓMO SE DIAGNOSTICA LA PRESIÓN ARTERIAL ALTA?

- La presión arterial consiste en dos números medidos con un tensiómetro y un estetoscopio.
- A estos números se les conoce como presión **sistólica** y presión **diastólica**.
- El número sistólico indica la fuerza con la que la sangre presiona los vasos sanguíneos cuando el corazón bombea. Es el número que aparece arriba y el valor más alto de los dos.
- El número **diastólico** indica la fuerza con la que la sangre presiona los vasos sanguíneos entre los latidos. Es el número que aparece abajo y el valor más bajo de los dos.
- Usted no sabrá si tiene presión arterial alta hasta que lo revise su equipo médico.
- La presión arterial alta se conoce como un "asesino silencioso" porque, por lo general, no provoca síntomas mientras daña su cuerpo.
- Entre más altos sean los números, la inquietud sobre hipertensión y el riesgo de muerte son más graves.
- Revise la siguiente tabla con su equipo médico para asegurarse de que sabe sobre la presión arterial alta.

ETAPAS DE LA PRESIÓN ARTERIAL ALTA

Categoría de la pre- sión arterial	Presión sistólica en mmHg (N.º superior)		Presión diastólica en mmHg (N.º inferior)
Normal	119 o menor	y	79 o menor
En riesgo	entre 120 y 139	y	entre 80 y 89
Alta	140 o mayor	o	90 o mayor

¿CÓMO SE TRATA LA PRESIÓN ARTERIAL ALTA?

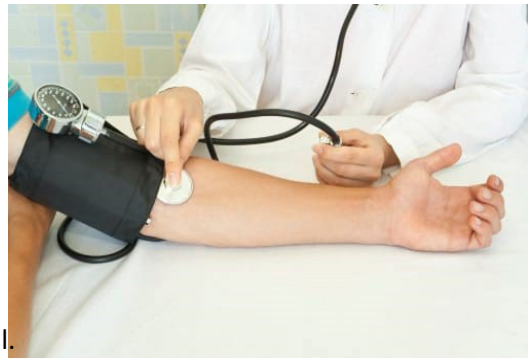
- **Medicamentos:** Hay muchos medicamentos para tratar la presión arterial alta. Hable con su equipo médico sobre sus opciones.
- **Cambios en el estilo de vida:** También hay cosas que puede hacer para ayudar a tratar la presión arterial alta, como hacer ejercicio y tener una alimentación saludable.

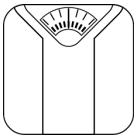
EDUCACIÓN PARA EL PACIENTE/CONTROL PERSONAL DEL CASO

HIPERTENSIÓN: lo que debe hacer

CONSEJOS PARA QUE MIDAN SU PRESIÓN ARTERIAL:

- ✓ Use mangas cortas para que su brazo esté expuesto.
- ✓ No beba café ni fume durante 30 minutos antes de que le midan la presión arterial.
- ✓ Evite realizar actividad física vigorosa antes de su cita.
- ✓ Vaya al baño antes de la medición. Una vejiga llena puede cambiar la medición de su presión arterial.
- ✓ Antes de la prueba, siéntese por cinco minutos recargado sobre la espalda y con los pies apoyados en el piso. Descanse su brazo en una mesa al nivel de su corazón.
- ✓ Pida al médico o enfermera que le diga los números de su presión arterial.



LO QUE SU EQUIPO DE ATENCIÓN MÉDICA HARÁ	¿CÓMO PUEDE AYUDARSE A SÍ MISMO?
Presión arterial de hoy:_/ Presión arterial de la última consulta:___/	Hable con su proveedor de atención primaria (Primary Care Provider, PCP) sobre sus niveles de presión arterial actuales y anteriores.
 Peso_____libras ¿Es un peso saludable para mí? Sí / No	Hable con su PCP sobre su peso.
¿Es seguro para mí comenzar a realizar actividad física de manera regular? Sí / No	Hable con su PCP sobre la actividad física recomendada.
¿Hay algún alimento, bebida u otra cosa que debería evitar cuando mi presión arterial sea alta?	✓ Evite la sal o los alimentos con alto contenido de sal (sodio). ✓ La cafeína puede elevar la presión arterial. ✓ Evite el alcohol y deje de fumar.
CONOZCA SUS MEDICAMENTOS	**CONSEJOS PARA AYUDARLE A RECORDAR TOMAR SUS MEDICAMENTOS PARA LA PRESIÓN ARTERIAL**
¿Cuál es el nombre de mi medicamento para la presión arterial? _____ ¿Cuáles son los posibles efectos secundarios de mi medicamento? _____ ¿Qué debo hacer si olvido tomar mi medicamento para la presión arterial a la hora recomendada? ¿Debería tomarlo en cuanto me acuerde o debería esperar hasta que sea la hora de la siguiente dosis?	• Tome sus medicamentos todos los días a la misma hora. Intente hacerlo al mismo tiempo que algo que haga regularmente, como cepillarse los dientes o comer. • Intente llevar una tabla o un calendario para registrar cuando tome su medicamento. Esto es bastante útil si toma más de un medicamento. • Cada vez que recoja un resurtido, haga una anotación en su calendario para ordenar y recoger el siguiente resurtido una semana antes de que se vaya a acabar el medicamento. Recuerde recoger el medicamento cada mes. Se resurtirá automáticamente siempre que la receta médica esté activa.

EDUCACIÓN PARA EL PACIENTE/CONTROL PERSONAL DEL CASO

Hipertensión: lo que debe saber

MANTENGA UN PESO SALUDABLE

- Tener sobrepeso aumenta su riesgo de desarrollar presión arterial alta y dificulta el tratamiento.
- Bajar al menos 10 libras puede disminuir la presión arterial.
- Hable con su equipo de atención médica sobre su peso.

HAGA EJERCICIO

- Estar activo físicamente es uno de los pasos más importantes que puede tomar para prevenir o controlar la presión arterial alta.
- Haga una actividad aeróbica, como caminar, durante al menos 30 minutos, cinco días a la semana.

REDUZCA EL SODIO (SAL) DE SU DIETA

- Todos necesitamos una pequeña cantidad de sodio para que nuestros cuerpos trabajen bien, pero la mayoría consume demasiado.
- Las dietas altas en sal pueden elevar su presión arterial,
- lo que puede causar enfermedades cardiacas o un derrame cerebral.
- No agregue sal a sus alimentos.
- Evite los alimentos con sal añadida, especialmente los productos de la cantina, como las nueces o papas saladas, y otros alimentos procesados.
- Cuando se reduce el consumo de sal, los niveles de presión arterial pueden disminuir en pocas semanas.

COMA MÁS FRUTAS Y VERDURAS

REDUZCA LA CAFEÍNA

¡NO FUME!

TOME SUS MEDICAMENTOS COMO SE LE INDICÓ

- Hable con su proveedor médico si tiene problemas con un medicamento.
- No suspenda sus medicamentos sin hablarlo con su equipo de atención médica.

CONOZCA SUS NÚMEROS

- Pregunte a su médico en cada consulta cuáles son los valores de su presión arterial y cómo se comparan con los de consultas pasadas.
- Hable con su equipo de atención médica sobre lo que puede hacer para reducir su presión arterial.