MedStar Health

Management of Hypertension in Adults Age 18 Years and Older
Clinical Practice Guideline
MedStar Health

These guidelines are provided to assist physicians and other clinicians in making decisions regarding the care of their patients. They are not a substitute for individual judgment brought to each clinical situation by the patient's primary care provider-in collaboration with the patient. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication but should be used with the clear understanding that continued research may result in new knowledge and recommendations.

Key points

- Ensure that every office blood pressure is taken correctly. Office blood pressures should be taken at the end of an intake to allow patients to rest for several minutes. They should be done using an appropriately sized cuff on a bare arm, sitting, with the arm supported. Double-check with your MAs to make sure they know how to do it.

- When office blood pressures are elevated, repeat them. Medical literature and experience show that second readings are often lower providing a more accurate picture. This can be done at the end of a visit by a MA, by an automated machine, or manually by the provider.

- Use either JNC 8 or ACC/AHA guidelines for diagnosis and treatment. MedStar recognizes that there is controversy about which guideline to follow and therefore recognizes both guidelines.

- Use home blood pressures to confirm diagnosis when possible. When office readings are over the guideline threshold, the USPSTF and AHA both recommend that this should be confirmed with home readings. For practitioners utilizing MedConnect enter home readings in the Home Monitoring tab of the vital signs form.

- All hypertensive patients should use lifestyle changes including a DASH diet, reduced salt, physical activity, alcohol moderation, and weight loss to improve blood pressure.

- A variety of medication classes are supported by evidence, but a diuretic should generally be in most regimens and used in difficult to control hypertension.

- Have patients who are not at goal return in 1 month, those with very high blood pressures in 2 weeks, and those at goal in 3-6 months.

- Monitor hypertensive therapy with home readings. For practitioners utilizing MedConnect enter an average bp or the last bp in the Home Monitoring Tab of the Vital Signs form.

Initial Approval Date and Reviews:	**Most Recent Revision and Approval Date:**	**Next Scheduled Review Date:**
10/98, revised 10/00, 7/03, 7/04, 8/06. 4/09, 4/10, 4/12, 4/14, 3/16, 3/18, 3/20, 3/22 by Ambulatory Quality Best Practice Committee	**March 2024**	March 2026 Ambulatory Best Practice

General Principles:

Uncontrolled hypertension can cause significant cardiovascular and renal morbidity and mortality. The judicious control of hypertension will decrease the risk of cardiovascular events and improve quality of life. The Surgeon General in his Call to Action to Control Hypertension urges to make hypertension control a national priority. The Surgeon General statement stressed the special additional relevance to control preventable health conditions when we faced global Covid-19 outbreak and it remains highly relevant today. Use of treatment protocols, team approach and self-measured blood pressure monitoring are cited important strategies for achieving the goal. The American College of Cardiology/American Heart Association (ACA/AHA) updated its guideline for Hypertension management in November of 2017. The 2017 ACC/AHA guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults, created controversy and confusion among different professional medical societies as well as practicing physicians. At the time of this writing, consensus still has not been achieved although CDC now uses2017 ACC/AHA guidelines to define hypertension.[1] MedStar provides information from both JNC8 and the 2017 ACC/AHA guidelines as well as useful tables from JNC 7 that continue to be relevant.

Per the ACC/AHA guideline, hypertension is defined as a systolic blood pressure (SBP) of ≥ 130 and diastolic blood pressure (DBP) of ≥ 80, instead of the previous definition of ≥ 140/90. The updated guideline eliminates the term pre-hypertension and instead uses the term elevated BP for SBP of 120 to 129 mm Hg and DBP <80. These new lowered thresholds for hypertension greatly increased the number of people diagnosed with hypertension, prompting ongoing controversy and debate among health care professionals.

Patients taking antihypertensive medications and who are maintaining their blood pressure levels within normal parameters are also considered to be hypertensive. The management of hypertension is multi-factorial and includes diet, exercise, lifestyle modifications (i.e., cessation of smoking, moderate alcohol intake) and medications, when indicated. The AHA guideline stresses these lifestyle modifications as an important part of the overall treatment plan.

[1] **Internet Citation**: Center for Disease Control and Prevention. Estimated Hypertension Prevalence, treatment, and Control Among U.S. Adults https://millionhearts.hhs.gov/data-reports/hypertension-prevalence.html

ACC/AHA 2017 Classification of Blood Pressure Readings for Diagnosis and Initial Treatment:

Adults Aged 18 Years or Older

Category	**Systolic** (mmHg)		**Diastolic** (mmHg)
Normal	< 120	and	< 80
Elevated BP	120-129	and	< 80
Hypertension			
Stage 1	130-139	or	80-89
Stage 2	≥ 140	or	≥ 90

JNC 7 Classification of Blood Pressure for Adults

Blood Pressure Classification	SBP mmHg	DBP mmHg
Normal	<120	and <80
Prehypertension	120–139	or 80–89
Stage 1 Hypertension	140–159	or 90–99
Stage 2 Hypertension	≥160	or ≥100

SBP, systolic blood pressure; DBP, diastolic blood pressure

I. Screening

Hypertension detection begins with proper blood pressure (BP) measurements, which should be obtained at each relevant health care encounter using proper technique. Patients should be instructed not to smoke or ingest caffeine at least one-half hour prior to BP check. The patient should relax and be sitting in a chair (feet on a floor, back supported) for more than 5min prior to the measurement. BP from both arms should be measured at first visit. Use the arm that gives the higher reading for subsequent readings after waiting two minutes between readings. The proper size cuff should be used, allowing the bladder within the cuff to encircle at least 80% of the arm. Use an average of ≥2 readings obtained on ≥ 2 occasions to estimate the individual's level of BP.

Screening for hypertension is recommended by the USPSTF (Grade A recommendation) for adults aged 18 and over. Screening is recommended annually for adults aged 40 and over and those who are at increased risk for high blood pressure and throughout pregnancy in pregnant patients (Grade B recommendation. Screening is

recommended every 3-5 years for 18–39-year-olds with prior normal blood pressure and no risk factors.[2,3] This recommendation apart from pregnancy, finalized in April of 2021, is a reaffirmation of the 2015 guidance. This differs from AHA recommendation of yearly screening for everybody 18 and older. For patients with elevated blood pressures, the USPSTF and AHA both recommend confirmation of diagnosis with home blood pressure or ambulatory blood pressure monitoring.

ACC/AHA Recommendations for Follow-Up Based on Initial Blood Pressure Measurements for Adults

Systolic (mmHg)*		**Diastolic** (mmHg)*	**Recommended Follow-Up** (modify the schedule of follow-up according to reliable information about past BP measurements, other cardiovascular risk factors, or target organ disease).
< 120	and	< 80	Normal -- Recheck yearly.
120-129	and	< 80	Elevated BP--Recommend healthy lifestyle changes and reassess in 3-6 months
130-139	or	80-89	Hypertension Stage 1: Assess the 10-year risk for heart disease and stroke using the atherosclerotic cardiovascular disease (ASCVD) risk calculator*. This tool is available as: • A phone app for iOS or Android • Online at http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/ • In MedConnect – ASCVD Risk Estimator component If risk is less than 10%, start with healthy lifestyle recommendations and reassess in 3-6 months. If risk is greater than 10% or the patient has known clinical cardiovascular disease (CVD), diabetes mellitus, or chronic kidney disease, recommend lifestyle changes and BP-lowering medication (1 medication); reassess in 1 month for effectiveness of medication therapy. If goal is met after 1 month, reassess in 3-6 months. If goal is not met after 1 month, consider different medication or titration. Continue monthly follow-up until control is achieved.

[2] **Internet Citation:** Final Recommendation Statement: Hypertension in Adults: Screening. U.S. Preventive Services Task Force. April 27, 2021. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hypertension-in-adults-screening#bootstrap-panel--7

[3] Final Recommendation Statement: Hypertensive Disorders of Pregnancy: Screening. September19, 2023 https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hypertensive-disorders-pregnancy-screening

≥140 mm	or	≥90	Hypertension Stage 2: Recommend healthy lifestyle changes and BP-lowering medication (2 medications of different classes); reassess in 1 month for effectiveness. If goal is met after 1 month, reassess in 3-6 months. If goal is not met after 1 month, consider different medications or titration. Continue monthly follow-up until control is achieved
≥ 180	And /or	≥ 120	Evaluate and treat (reinstitute or intensify antihypertensive drug therapy) or refer to source of care within 1 week depending upon the clinical situation.
≥180 + target organ damage	And /or	≥ 120	Admit to ICU

*ASCVD risk calculator takes race into account as one of the risk factors to assess a 10-year risk for heart disease and stroke. There is a concern among some clinicians that this race-based approach might be outdated. The American Heart Association has recently developed a new calculator called PREVENT that takes race out of the equation. It also factors in new measures of cardiovascular disease, kidney disease, and metabolic disease, which includes Type 2 diabetes and obesity. PREVENT has an option to include an index that incorporates measures such as education, poverty, unemployment, and factors based on a person's environment, and the new calculator has similar accuracy among racial and ethnic groups. An online tool became available. American Heart Association PREVENT™ (Predicting Risk of cardiovascular disease EVENTs) risk calculator

The AHA guideline recommends greater use of out-of-office measurements to confirm the diagnosis of hypertension. The guideline recommends using those measurements to detect white coat hypertension (high office blood pressure but normal out-of-office blood pressure) and masked hypertension (normal office blood pressure but high out-of-office blood pressure). Patients with office BP≥130/80 but <160/100 and a suspicion for white coat HTN are to undergo daytime ambulatory BP monitoring or home BP monitoring. Measurements of BP<130/80 would confirm white coat HTN. Lifestyle modifications and annual ambulatory BP monitoring or home BP monitoring should be recommended. Outside office BP of≥130/80 would imply the diagnosis of HTN. Patients with office BP 120-129/<80 and suspected masked HTN are likewise to undergo daytime ambulatory BP monitoring or home BP monitoring. Outside office measurements of ≥130/80 would indicate masked hypertension in those patients. See Appendix 3.

II. Medical Evaluation after Diagnosis of Hypertension

Medical history that includes diet, exercise, lifestyle, presence of comorbid conditions (i.e., DM, renal disease), tobacco, alcohol or illicit drugs, and family history should be obtained.

Physical examination should focus on the following:
1. Blood Pressure (2 or more readings separated by 2 minutes; use the higher reading)
2. BMI (Body Mass Index recommended)
3. Fundoscopic examination
4. Neck exam (bruits, thyromegaly)
5. Heart exam (size, murmurs, S3 or S4)
6. Lung exam
7. Abdomen (abdominal and femoral bruits, masses, palpable kidneys, aortic pulsation)
8. Extremities (pulses, edema)
9. Neurologic exam

Initial (baseline) laboratory testing should include the following: Urinalysis, CBC, lipid profile, Chem 7, and EKG.

Consider Secondary Causes of Hypertension including:
Sleep apnea
Drug- induced or drug related.
Chronic kidney disease
Primary aldosteronism
Renovascular disease
Chronic steroid therapy and Cushing syndrome
Pheochromocytoma
Coarctation of the aorta
Thyroid or parathyroid disease.
Alcohol Abuse

Red flags for secondary hypertension which should prompt screening/work up for secondary causes include: Onset at a young age (under 30) or onset of diastolic hypertension in an older adult (over 65), extremely elevated blood pressure, uncontrolled hypertension in a patient who was previously well controlled, drug resistant hypertension, unprovoked hypokalemia, and end organ damage disproportionate to the degree of hypertension.

III. Treatment of Hypertension

Treatment Goals and Follow-up—ACC/AHA recommendations, November 2017:

Patients with elevated BP (BP 120-129/<80) are to be recommended non-pharmacological therapy and to be reassessed in 3-6 months. Patients with Stage 1 hypertension (BP 130-139/80/89), no known ASCVD and a low estimated 10-year CVD risk (<10%) are also to be managed non-pharmacologically and to be re reassessed in 3-6 months. Patients with stage 1 hypertension and clinical ASCVD or estimated 10-year CVD risk of >10%,

in addition to lifestyle changes, are to be started on a BP lowering medication and to be reassessed every month until BP goal is met at which point, they can be reassessed every 3-6 months. Patients with stage 2

hypertension (BP≥140/90) are to be managed with both non-pharmacological and pharmacological therapy and reassessed every month until BP goal is achieved after which reassessment every 3- 6 month is appropriate.

BP Targets--ACC/AHA 2017 Guideline:

The goal of therapy for all patients diagnosed with hypertension is achieving BP of <130/80. The threshold for starting pharmacological therapy for patients with no clinical CVD and low 10 year estimated risk of CVD as well as patients in need of secondary stroke prevention is 140/90, while it is 130/80 for everybody else, including patients over the age of 65 (with the exception of institutionalized patients with high burden of comorbidities and limited life expectancy where clinical judgment should prevail).

Clinical condition	BP threshold for Pharmacologic therapy	BP Target
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)

Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease after renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

Not all professional organizations endorsed the new ACC/AHA guideline. The AAFP decided to not endorse the AHA/ACC Hypertension Guideline and continues to endorse JNC-8. On 01/23/2018 ACP joined the AAFP opinion, particularly for older adults (60 and over).

Treatment Goals and Follow-up—JNC 8, 2014

National hypertension guidelines were updated in 2014 and published in JNC 8 after an evidence-based literature review.[4]For patients with diabetes and patients under 60 yo, a goal of <140/90 was recommended. For patients ≥ 60 yo, a higher goal of <150/90 was recommended. The guideline optionally allowed the lower JNC 7 goal of <140/90 if treatment is tolerated.

[4] James PA, Oparil S, Carter BL, et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014;311(5):507-520. doi:10.1001/jama.2013.284427. Available from http://jama.jamanetwork.com/article.aspx?articleid=1791497

BP Targets—JNC 8, 2014

	Age 18-59	*Age 60-85*
Diabetes Mellitus, ***Chronic Kidney Disease***	***< 140/90***	
No Diabetes Mellitus	***< 140/90***	***<150/90***

Other Optional Treatment Goals

The SPRINT trial[5], a randomized, open-label study assessed a lower blood pressure goal of SBP < 120 compared with SBP <140. The study included high-risk adults over 50 and those with a high cardiovascular risk based on a diagnosis of CAD, CKD (GFR 20-60), age 75 and older, and a 10-year Framingham risk of 15% or more. The study found lower composite outcome of time to first cardiovascular event at a median of 3.2 years of 1.65% in the <120 group and a rate of 2.19% in the <140 group (HR 0.75, 95% confidence interval, 0.64 to 0.89; P<0.001). All-cause mortality was also lower, but rates of serious adverse events including syncope, hypotension, electrolyte problems and AKI were higher in the intensive BP control group.

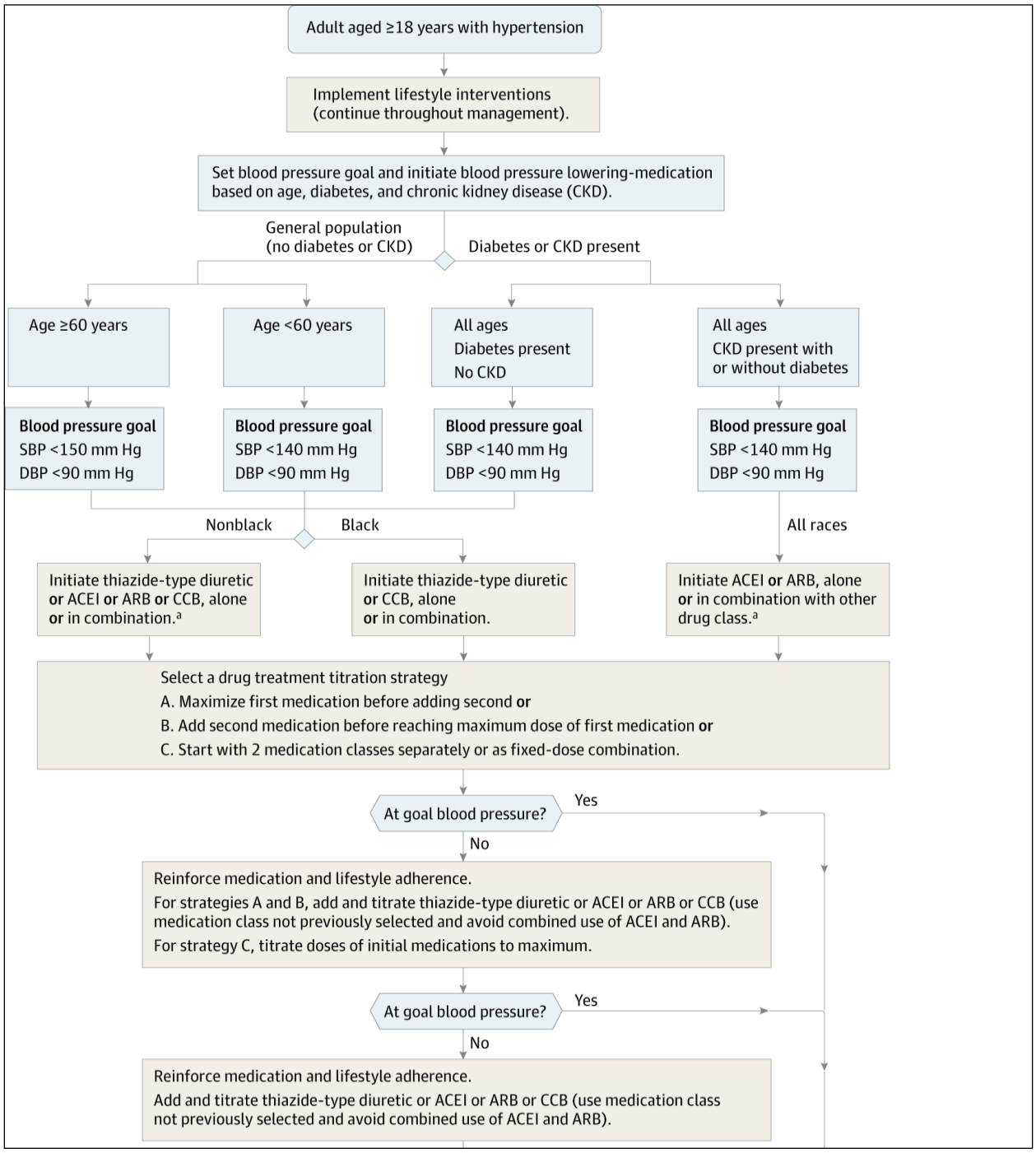
The MedStar Ambulatory Best Practice Committee recognizes the differences between guidelines as well as ongoing controversy and the need for more research and further review.

Medication Choice in Hypertension Management

Initial choice of medications was suggested by JNC 8 in the algorithm below. There is not much difference in drug choices between the two guidelines. Thiazide-type diuretics should be used in drug treatment for most patients with uncomplicated hypertension, either alone or combined with drugs from other classes. Certain high-risk conditions are compelling indications for the initial use of other antihypertensive drug classes (see table below). Most patients with hypertension will require 2 or more antihypertensive medications to achieve goal BP. If BP is more than 20/10 mm Hg above goal BP, considerations should be given to initiating therapy with two agents, one of which usually should be a thiazide-type diuretic. ACC/AHA recommends considering initiation of 2 agents from different classes for the patients with stage 2 hypertension. It is of note that both of those guidelines, JNC8 and 2017 ACC/AHA, take race into account when choosing initial pharmacological treatment. That approach was questioned lately, and more studies are needed on the topic.

[5] The SPRINT Research Group. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. N Engl J Med 2015; 373:2103-2116November 26, 2015DOI: 10.1056/NEJMoa1511939. Available from http://www.nejm.org/doi/full/10.1056/NEJMoa1511939

JNC 8 Treatment Algorithm



Compelling Indications—JNC 7

High-Risk Conditions with Compelling Indication*	Diuretic	β-Blocker	ACE Inhibitor	ARB	CCB	Aldosterone Antagonist
Heart Failure	●	●	●	●		●
Post- Myocardial Infarction		●	●			●
High Coronary Disease Risk	●	●	●		●	
Diabetes	●		●	●	●	
Chronic Kidney Disease			●	●		
Recurrent Stroke Prevention	●		●			

Abbreviations: ACE - angiotensin- converting enzyme; ARB, angiotensin-receptor blocker; and CCB, calcium channel blocker

*Compelling indications for antihypertensive drugs are based on benefits from outcome studies or existing clinical guidelines; the compelling indication is managed in parallel with the blood pressure.

Resistant Hypertension

Resistant hypertension is defined by the American Heart Association (AHA) as blood pressure that remains above goal despite concurrent use of three antihypertensive agents of different classes prescribed at maximum recommended (or maximally tolerated) antihypertensive doses and including a diuretic if possible or when blood pressure control requires four or more medications. A subgroup of resistant hypertension which cannot be controlled with maximal medical therapy (five or more medications including chlorthalidone and a mineralocorticoid receptor antagonist such as spironolactone) is defined as refractory hypertension.

Resistant hypertension is to be confirmed and distinguished from pseudo resistant hypertension by confirming that blood pressure is above goal when measured in the office setting using proper technique, confirming uncontrolled hypertension with out-of-office measurements (i.e., ambulatory blood pressure monitoring or home blood pressure monitoring), and by considering and excluding nonadherence to antihypertensive therapy.

Once resistant hypertension is confirmed contributing lifestyle factors such as obesity, physical inactivity alcohol overuse and high-salt diet, need to be identified and addressed.

Medications and supplements contributing to poor blood pressure control need to be identified and eliminated or minimized. Common offenders include sympathomimetics (amphetamines, decongestants, diet meds), NSAIDs, stimulants, oral contraceptives containing estrogen, glucocorticoids, and licorice.

Patients with resistant hypertension need to be screened for secondary causes. Etiologies include primary aldosteronism (elevated aldosterone/renin ratio), CKD, renal artery stenosis, pheochromocytoma and obstructive sleep apnea.

Pharmacological treatment consists of maximizing diuretics, adding a mineralocorticoid receptor antagonist and other agents with different mechanisms of action, utilizing loop diuretics in patients with CKD. If blood pressure remains uncontrolled the patient should be referred to a specialist

IV. Dietary Management of BP

A substantial body of evidence strongly supports the concept that multiple dietary factors affect BP. Dietary modifications that effectively lower BP are weight loss, reduced salt intake, increased potassium intake, moderation of alcohol consumption (among those who drink), and consumption of an overall healthy dietary pattern, called the DASH diet (appendix). Of substantial public health relevance are findings related to blacks and older individuals. Specifically, blacks are especially sensitive to the BP-lowering effects of reduced salt intake, increased potassium intake, and the DASH diet. Furthermore, it is well documented that older individuals, a group at high risk for BP-related cardiovascular and renal diseases, can make and sustain dietary changes. Dietary changes serve as initial treatment before drug therapy. In those hypertensive patients already on drug therapy, lifestyle modifications, particularly a reduced salt intake, can further lower BP. The following table provides a breakdown of the recommendations.

Diet-Related Lifestyle Modifications That Effectively Lower BP
(From 2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk: A Report of the ACC/AHA task Force on Practice Guidelines. Circulation. 2014; 129 [suppl 2]: S76–S99)

Lifestyle Modification	**Recommendations**
Weight loss	For overweight or obese persons, lose weight, ideally attaining a BMI <25 kg/m^2; for non-overweight persons, maintain desirable BMI <25 kg/m^2
Reduced salt intake	• Consume no more than 2400 mg of sodium/day. • Further reduction of sodium intake to 1500 mg/d can result in even greater reduction in BP. • Even without achieving these goals, reducing sodium intake by at least 1000 mg/d lowers BP
DASH-type dietary patterns	Consume a diet rich in fruits and vegetables (8–10 servings/d), rich in low-fat dairy products (2–3 servings/d), and reduced in saturated fat and cholesterol
Increased potassium intake	Increase potassium intake to 120 mmol/d (4.7 g/d), which is also the level provided in DASH-type diets
Moderation of alcohol intake	For those who drink alcohol, consume ≤2 alcoholic drinks/d (men) and ≤1 alcoholic drink/d (women)
Increased physical activity	

V. Long Term Follow- Up and Monitoring

Once antihypertensive drug therapy is initiated, most patients should return for follow-up and adjustment of medication at approximately monthly intervals until the BP goal is reached. More frequent visits will be necessary for patients with stage 2 hypertension or with complications or comorbid conditions. Serum potassium and creatinine should be monitored at least 1 time per year.

After BP is at goal and stable, follow-up visits can usually be at 3–6-month intervals. Co-morbidities, such as heart failure, associated disease such as diabetes, and the need for laboratory tests influence the frequency of visits. Other cardiovascular risk factors should be treated to their respective goals, and tobacco avoidance should be promoted vigorously. Low-dose aspirin therapy should be considered only when BP is controlled, because the risk of hemorrhagic stroke is increased in patients with uncontrolled hypertension. Once a year a complete physical exam with fundoscopic examination and lab evaluation (including urinalysis, basic metabolic panel, and EKG) may be considered.

Management of HTN – Follow-up Intervals

Condition	**Recommended Follow-up Interval**
BP not at goal	1 month
BP >160/100	2 weeks
BP at goal	3-6 months

VI. Hypertensive Urgency and Emergencies

Patients with marked BP elevations and acute target-organ damage (e.g., encephalopathy, myocardial infarction, unstable angina, pulmonary edema, eclampsia, stroke, head trauma, and life-threatening arterial bleeding or aortic dissection) require hospitalization and parental drug therapy.
Patients with markedly elevated BP but without acute target-organ damage usually do not require hospitalization, but they should receive prompt oral antihypertensive therapy and close follow up. Careful consideration for identifiable causes of new or worsening hypertension should be evaluated as appropriate.

VII. Patient Education. Sources of patient information can be obtained through:
NHLBI (National Heart, Lung, and Blood Institute; https://www.nhlbi.nih.gov/)
American Family Physician website; https://www.aafp.org/afp/2021/0900/p237-s1.html
All patients should understand that in order to create a change in one's blood pressure it is necessary to make some lifestyle changes. Some of the basic efforts should be in eating healthy foods, low in salt, cholesterol and fat, and to start a moderate exercise program. Below are the recommendations for lifestyle management for all stages of Hypertension.

Lifestyle Modifications for Hypertension Prevention and Management

1. Lose weight if overweight.
2. Increase physical activity (30 -45 minutes at least 3 days per week)

3. Limit alcohol intake to no more than 1 oz (30 ml) of ethanol or 1 (12 oz.) beer, 10 oz (300 ml) of wine, or 2 oz (60 ml) of 100 - proof whiskey per day or 0.5 oz of ethanol per day for women and lighter weight people.
4. Reduce sodium intake to no more than 2.4 grams of sodium, which is roughly one tsp. of salt.
5. Maintain adequate intake of dietary potassium. Good sources include bananas, orange juice, yogurt, prunes and winter squash.
6. Maintain adequate intake of dietary calcium and magnesium.
7. Stop smoking and reduce intake of dietary saturated fat and cholesterol.
8. Copy of DASH diet attached page 5, this can be Xeroxed for appropriate patients.

Patient education should take place at each visit with particular emphasis in refractory patients.

VIII. References:

- 2014 Evidence-Based Guidelines for the Management of High Blood Pressure in Adults (JNC8). JAMA 2014; 311(5):507-520 (published online December 18, 2013) https://jamanetwork.com/journals/jama/fullarticle/1791497
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IX. Appendices:

The DASH Diet (Dietary Approaches to Stop Hypertension)

Food Group	Daily Serving	Serving Size	Examples and Notes	Significance in the DASH Diet Pattern
Grains and grains products	6 - 8	1 slice bread 1 oz. dry cereal ½ cup cooked rice, pasta, or cereal	Whole wheat bread and rolls, whole wheat pasta, English muffin, pita bread, bagel, cereals, grits, oatmeal, brown rice, unsalted pretzels and popcorn	Major sources of energy and fiber
Vegetables	4 - 5	1c raw leafy vegetables 1/2c raw cut up or cooked vegetables 4 oz vegetable juice	Broccoli, carrots, collards, green beans, green peas, kale, lima beans, potatoes, spinach, squash, sweet potatoes, tomatoes	Rich sources of potassium, magnesium, and fiber
Fruits	4 - 5	4 oz fruit juice 1 medium fruit ¼ c dried fruit ½ c fresh, frozen, or canned fruit	Apples, apricots, bananas, dates, grapes, oranges, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, raisins, strawberries, tangerines	Important sources of potassium, magnesium, and fiber
Fat free or low-fat milk, milk products	2 - 3	1 cup milk 1c yogurt 1 ½ oz. cheese	Fat-free (skim) or low-fat (1%) milk or buttermilk, fat-free, low-fat, or reduced-fat cheese, fat-free or low-fat regular or frozen yogurt	Major sources of calcium and protein
Lean meats, poultry, and fish	6 or less	1 oz cooked meats, poultry, or fish 1 egg	Select only lean; trim away visible fats; broil, roast, or poach; remove skin from poultry	Rich sources of protein and magnesium
Nuts, seeds, and legumes	4 - 5/wk.	1/3 cup or 1 ½ oz. nuts 2 Tbsp peanut butter 2 Tbsp or ½ oz seeds ½ cup cooked legumes (dry beans and peas)	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter, kidney beans, lentils, split peas	Rich sources of energy, magnesium, potassium, protein, and fiber
Fats and oils	2 – 3	1 tsp soft margarine 1 tsp vegetable oil	1 Tbsp mayonnaise 2 Tbsp salad dressing	The DASH study had 27 percent. of calories as fat, including fat in or added to foods
Sweets and added sugars	5 or less per week	1 Tbsp sugar 1 Tbsp jelly or jam ½ cup sorbet, gelatin 1 cup lemonade	Fruit-flavored gelatin, fruit punch, hard candy, jelly, maple syrup, sorbet and ices, sugar	Sweets should be low in fat

- ⇒ Since eggs are high in cholesterol, limit egg yolk intake to no more than four per week; two egg whites have the same protein content as 1 oz of meat.
- ⇒ Fat content changes serving amount for fats and oils. For example, 1 Tbsp of regular salad dressing equals one serving; 1 Tbsp of a low-fat dressing equals one-half serving 1 Tbsp of a fat-free dressing equals zero servings.
- ⇒ From the Dietary Approaches to Stop Hypertension (DASH) clinical study. U.S. Department of Health and Human Services: Dash Diet, Revised 2006. Retrieved from https://www.nhlbi.nih.gov/files/docs/public/heart/new_dash.pdf
- ⇒ The results show that DASH "combination diet" lowered blood pressure and, may help prevent and control high blood pressure. The "combination diet" is rich in fruits, vegetables, low-fat dairy foods, and low in saturated and total fat. It is also low in cholesterol, high in dietary fiber, potassium, calcium, and magnesium and moderately high in protein. The DASH eating plan shown above is based on 2000 calories a day. Depending on the energy needs, number of daily servings in a food group may vary from those listed.

The DASH Diet Sodium Table

Sodium Table - Food Group	Examples	Sodium (mg)
Whole and other grains and grain products*	Cooked cereal, rice, pasta, unsalted, 1/2 cup. Ready-to-eat cereal, 1 cup. Bread, 1 slice	0–5 mg 0–360 mg 110–175 mg
Vegetables	Fresh or frozen, cooked without salt, 1/2 cup. Canned or frozen with sauce, 1/2 cup. Tomato juice, canned, 1/2 cup	1–70 mg 140–460 mg 330 mg
Fruit	Fresh, frozen, canned, 1/2 cup	0–5
Low-fat or fat-free milk and milk products	Milk, 1 cup. Yogurt, 1 cup. Natural cheeses, 11/2 oz Process cheeses, 2 oz	107 mg 175 mg 110–450 mg 600 mg
Nuts, seeds, and legumes	Peanuts, salted, 1/3 cup. Peanuts, unsalted, 1/3 cup. Beans, cooked from dried or frozen, without salt, 1/2 cup. Beans, canned, 1/2 cup	120 mg 0–5 mg 0–5 mg 400 mg
Lean meats, fish, and poultry	Fresh meat, fish, poultry, 3 oz Tuna canned, water pack, no salt added, 3 oz. Tuna canned, water pack, 3 oz. Ham, lean, roasted, 3 oz	30–90 mg 35–45 mg 230–350 mg 1,020 mg

* Whole grains are recommended for most grain servings. Only a small amount of sodium occurs naturally in foods. Most sodium is added during processing. This table gives examples of sodium in some foods.

Tips to Reduce Salt

- Choose low- or reduced-sodium, or no-salt-added versions of foods and condiments when available.
- Choose fresh, frozen, or canned (low-sodium or no-salt-added) vegetables.
- Use fresh poultry, fish, and lean meat, rather than canned, smoked, or processed types.
- Choose ready-to-eat breakfast cereals that are lower in sodium.
- Limit cured foods (such as bacon and ham); foods packed in brine (such as pickles, pickled vegetables, olives, and sauerkraut); and condiments (such as mustard, horseradish, ketchup, and barbecue sauce). Limit even lower sodium versions of soy sauce and teriyaki sauce. Treat these condiments sparingly as you do table salt.

- Cook rice, pasta, and hot cereals without salt. Cut back on instant or flavored rice, pasta, and cereal mixes, which usually have added salt.
- Choose "convenience" foods that are lower in sodium. Cut back on frozen dinners, mixed dishes such as pizza, packaged mixes, canned soups or broths, and salad dressings—these often have a lot of sodium.
- Rinse canned foods, such as tuna and canned beans, to remove some of the sodium.
- Use spices instead of salt in cooking and at the table, flavor foods with herbs, spices, lemon, lime, vinegar, or salt-free seasoning blends. Start by cutting salt in half.

The DASH Diet Potassium Tab

Potassium -Food Group	Examples	Potassium (mg)
Vegetables	Potato, 1 medium Sweet Potato, 1 medium Spinach, cooked, 1/2 cup. Zucchini, cooked, 1/2 cup. Tomato, fresh, 1/2 cup. Kale, cooked, 1/2 cup. Romaine lettuce, 1 cup. Mushrooms, 1/2 cup. Cucumber, 1/2 cup	926 mg 540 mg 290 mg 280 mg 210 mg 150 mg 140 mg 110 mg 80 mg
Fruit	Banana, 1 medium Apricots, 1/4 cup. Orange, 1 medium Cantaloupe chunks, 1/2 cup. Apple, 1 medium	420 mg 380 mg 237 mg 214 mg 150 mg
Low-fat or fat-free milk and milk products	Milk, 1 cup. Yogurt, 1 cup	380 mg 370 mg
Nuts, seeds, and legumes	Cooked soybeans, 1/2 cup. Cooked lentils, 1/2 cup. Cooked kidney beans, 1/2 cup. Cooked split peas, 1/2 cup. Almonds, roasted, 1/3 cup. Walnuts, roasted, 1/3 cup. Sunflower seeds, roasted, 2 Tbsp. Peanuts, roasted, 1/3 cup	440 mg 370 mg 360 mg 360 mg 310 mg 190 mg 124 mg 120 mg
Lean meats, fish, and poultry	Fish (cod, halibut, rockfish, trout, tuna), 3 oz Pork tenderloin, 3 oz Beef tenderloin, chicken, turkey, 3 oz	200–400 mg 370 mg 210 mg

Pharmacological Therapy

Cost reflects 30-day supply for normal maintenance dose based on AWP (Lexicomp Online). Brand names shaded in gray are no longer available on the market. Note that many generics are available for $4 per month through discount programs, see GoodRx (http://www.goodrx.com/) or NeedyMeds (http://www.needymeds.org) to search for drug prices, coupons, and patient assistance programs.

Drug Name/ Class	***Starting Dose***	***Maintenance Dose***	***Maximum Dose***	***Cost (30 day)***
ACE Inhibitors				
Benazepril *Lotensin ®*	*10 mg every day* *5 mg once daily in patients also taking a diuretic.* CrCl<30: 5 mg *daily*	*20-40 mg daily in 1-2 divided doses*	*80 mg every day* *CrCl<30: 40 mg daily* *Hemodialysis or peritoneal dialysis: 25-50% of usual dose*	*$32*
Captopril	*6.25-25 mg 2-3 times daily* *CrCl 10-50: 75% of normal dose every 12-18 hrs.* *CrCl < 10: 50% of normal dose every 24 hrs.* **always administer at least 1 hr. before meals*	*25- 50 mg 2 -3 times daily*	*50 mg 3 times a day* *Peritoneal dialysis: 75% of normal dose every 12-18 hrs.* *Hemodialysis: on dialysis days admin after dialysis*	*$261*
Enalapril *Vasotec®* *Epaned® (oral solution)*	*5-10 mg daily.* *(if on diuretic start at 2.5 mg daily)* *CrCl10-30: 2.5 mg daily* *Hemodialysis 2.5 mg on dialysis days*	*20 mg daily in 1-2 divided doses*	*40 mg every day in 1-2 divided doses* *CrCl 10-30: 20mg/day*	*$11-$83* *solution: $4.08/mL*
Fosinopril	*10 mg daily*	*10-40 mg daily*	*80 mg daily*	*$12-$49*
Lisinopril *Zestril®,* *Obrelis® (oral solution)*	*5-10 mg daily* *CrCl 10-30: 2.5-5 mg daily* *CrCl<10: 2.5 mg daily* *Hemodialysis: 2.5 mg daily*	*20-40 mg daily*	*40 mg daily*	*$1-$47* *Obrelis: $5.01/mL (brand only)*
Moexipril	*3.75-7.5 mg daily1 hr. before meals*	*7.5-30 mg in 1-2 divided doses 1 hr. before meals*	*30 mg daily in 1-2 divided doses* *CrCl<40: 15 mg daily*	*$88*

Perindopril	*4 mg daily* *CrCl >30: 2 mg daily* *CrCl <30, use not recommended.* *Hemodialysis: 2 mg on dialysis days—given after dialysis*	*4-8 mg daily in 1-2 divided doses*	*16 mg daily* *8 mg daily in adults > 65 y and in renal impairment with CrCl ≥30*	*$26-$84*
Quinapril *Accupril®*	*10-20 mg daily* *CrCl 30-60: 5 mg daily* *CrCl 10-30: 2.5 mg daily*	*20-40 mg daily in 1-2 divided doses*	*80 mg daily in 1-2 divided doses*	*$37*
Ramipril *Altace®*	*2.5 mg daily* *CrCl<30: 1.25mg daily*	*2.5-20 mg daily in 1 or 2 divided doses*	*20 mg daily in 1-2 divided doses* *CrCl<30: 5 mg daily*	*$51-133*
Trandolapril	*1mg daily* *CrCl<30: 0.5 mg daily*	*2-4 mg daily*	*4 mg daily*	*$37*
Angiotensin Receptor Blockers				
Azilsartan *Edarbi ®*	*40 mg daily*	*40-80 mg daily*	*80 mg daily*	*$285 (brand only)*
Candesartan *Atacand®*	*8 mg daily*	*8-32 mg daily in 1-2 divided doses*	*32 mg daily*	*$83-$129*
Irbesartan *Avapro®*	*150mg daily*	*150-300 mg daily*	*300 mg daily*	*$111*
Losartan *Cozaar®*	*25-50 mg daily*	*100 mg daily in 1-2 divided doses*	*100 mg daily in 1-2 divided doses*	*$6-$93*
Olmesartan *Benicar®*	*20 mg daily*	*20-40 mg daily*	*40 mg daily*	*$188-$288*
Telmisartan *Micardis®*	*20-40 mg daily*	*40-80 mg daily*	*80 mg daily*	*$168*
Valsartan *Diovan®*	*80-160 mg daily*	*160-320 mg daily*	*320 mg daily*	*$17-$250*
Beta Blockers				
Acebutolol	*200-400 mg in 1-2 divided doses* *CrCl 25-49: reduce dose by 50%* *CrCl < 25: reduce dose by 75%*	*200-800 mg in 1-2 divided doses*	*1200 mg/day in 2 divided doses*	*$42-$116*
Atenolol *Tenormin®*	*25-50 mg daily*	*50-100 mg daily*	*100 mg daily* *CrCl 10-30: 50 mg/d*	*$26-$45*

			CrCl <10: 25 mg daily *Hemodialysis: give after dialysis or give 25-50 mg supplemental dose after dialysis*	
Betaxolol	*5-10 mg daily* *Hemodialysis: 5 mg daily*	*10-20 mg daily*	*20mg daily*	*$37-$80*
Bisoprolol	*2.5-5 mg daily* *CrCl < 20: 2.5 mg daily*	*2.5-10 mg daily*	*20 mg daily*	*$42-$68*
Metoprolol tartrate *Lopressor®* *(immediate release)*	*50 mg twice daily*	*100-200 mg in 2 divided doses*	*400 mg daily in 2-3 divided doses*	*$24-48*
Metoprolol succinate *Toprol XL®*	*25-100 mg daily*	*50-200 mg daily*	*400 mg daily*	*$4-$92*
Nadolol *Corgard®*	*40 mg daily* *CrCl 31-50: give every 24-36 hrs.* *CrCl 10-30: give every 24-48 hrs.* *CrCl <10: give every 40-60 hrs.* *Hemodialysis: give usual dose after dialysis*	*40-120 mg daily*	*320 mg daily*	*$4-$448*
Nebivolol *Bystolic®*	*5 mg daily* *CrCl <30: 2.5 mg daily* *Moderate hepatic impairment: 2.5 mg daily.* *Severe hepatic impairment: contraindicated*	*5-10 mg daily*	*40 mg daily*	*$101-$173*
Pindolol	*5 mg twice daily*	*5- 30 mg twice daily*	*60 mg daily in 2-3 divided doses*	*$66-$246*
Propranolol *Inderal®*	*IR: 40 mg twice daily on an empty stomach*	*IR: 80-160 mg daily in divided doses*	*IR: 640 mg daily*	*$14-$58*
Propranolol *Inderal LA®* *Inderal XL®* *InnoPranXL®*	*Inderal LA:80 mg daily* *XL forms: 80 mg daily at bedtime* *Give consistently with or without food*	*LA: 80-160 mg daily* *XL: 80-160 mg daily*	*LA: 640 mg daily* *XL: 160 mg daily*	*$90-$117 (generic for Inderal LA)* *$90(both XL forms*

				available in brand name only)
Alpha Blockers				
Doxazosin *Cardura®* *Immediate release*	*1 mg* **if therapy is stopped for several days, restart with 1 mg and titrate up*	*1-2 mg daily*	*16 mg daily*	*$41*
Prazosin *Minipress®*	*1 mg 2 or 3 times a day*	*6-15 mg daily in divided doses*	*20 mg daily in divided doses*	*$50-$487*
Terazosin	*1 mg every night*	*1-2 mg every night* **may use twice daily dosing if response diminished at 24 hrs.*	*20 mg every night*	*$96*
Alpha-Beta Blockers				
Carvedilol *Coreg®* *Coreg CR®*	*6.25 mg 2 times a day IR* *20 mg daily for CR*	*6.25-25 mg 2 times a day (IR)* *20-80 mg daily (CR)*	*25 mg 2 times a day (IR)* *80 mg daily (CR)*	*$128 IR* *$613 CR*
Labetalol	*100 mg 2 times a day*	*200-800 mg 2 times a day*	*1200 mg 2 times a day*	*$68-$274*
Calcium Channel Blockers				
Amlodipine *Norvasc®*	*2.5-5 mg daily* *(2.5 mg daily in frail, small patients, when added to other antihypertensives, and in severe hepatic impairment)*	*2.5-10 mg daily*	*10 mg daily*	*$58-$72*
Diltiazem *Cardizem CD®* *Cartia XT®*	*120-240 mg daily*	*120-360 mg daily*	*480mg daily*	*$78*
Diltiazem 12 hour extended -release	*60-120mg daily*	*240-360 mg daily in 2 divided doses*	*360 mg daily in 2 divided doses*	*$392*
Diltiazem *Tiazac®* *Taztia XT* *Tiadylt ER®*	*120-240 mg daily*	*120-360 mg daily*	*540 mg daily*	*$307*
Diltiazem *Cardizem LA®* *Matzim LA®*	*120-240 mg daily*	*120-360 mg daily*	*540 mg daily*	*$140*
Felodipine	*2.5 mg - 5 mg daily*	*2.5-10 mg daily*	*10 mg daily*	*$48-$112*

	(2.5 mg in hepatic impairment)			
Isradipine	*2.5 mg twice daily*	*5-10 mg in 2 divided doses*	*10 mg in 2 divided doses*	*$114 - $167*
Nicardipine	*20 mg 3 times a day*	*20-40 mg 3 times a day*	*40 mg 3 times a day*	*$1395-$2788*
Nifedipine ER Procardia XL	*30-60 mg once daily*	*30-90 mg daily*	*90 mg daily*	*$42-$91*
Nisoldipine Sular®	*17 mg daily at the same time each day on an empty stomach. (8.5 mg daily in geriatric patients and in hepatic impairment)*	*17-34 mg daily*	*34 mg daily*	*$1044 (brand only)*
Nisoldipine Extended Release	*20 mg at the same time each day on an empty stomach (10 mg daily in geriatric patients and in hepatic impairment)*	*20-40 mg daily*	*40 mg daily*	*$494-$538*
Verapamil	*40-80 mg 3 times a day*	*120-360mg daily in 3 divided doses*	*480 mg in 3 divided doses*	*$21-$62*
Verapamil Verelan® Verelan PM®	*Verelan: 120-180 mg every morning Verelan PM: 100-200 mg at bedtime *generic same dosing as Calan SR*	*Verelan: 120-360mg/day in 1-2 divided doses Verelan PM: 100-300 mg at bedtime*	*Verelan: 480 mg daily in 1-2 divided doses Verelan PM: 400 mg at bedtime*	*$52-$192*
Diuretics				
Bumetanide Bumex® (not FDA approved for HTN)	*1 mg daily*	*1 mg daily*	*0.5-2 mg daily in 1-2 divided doses*	*$81*
Chlorthalidone Thalitone®	*12.5-25 mg daily*	*12.5-25mg daily*	*25 mg daily*	*$79*
Chlorothiazide Diuril®	*500-1000 mg every day in 1-2 divided doses*	*500-1500 mg every day in 1-2 divided doses*	*2000 mg every day in 1-2 divided doses*	*$105-$315 (oral solution only)*
Epleronone Inspra®	*50 mg daily*	*50 mg once daily to 50 mg twice daily*	*100 mg daily in divided doses*	*$130-$260*
Furosemide Lasix®	*40 mg twice daily*	*20-80mg daily in 2 divided doses*	*80 mg in 2 divided doses*	$15-$47
Hydrochlorothiazide (HCTZ)	*12.5-25 mg daily*	*25-50 mg daily in 1-2 divided doses*	*50 mg daily*	*$2 -$5*
Indapamide	*1.25-2.5 mg daily*	*1.25 – 2.5 mg daily*	*5 mg daily*	*$47*
Metolazone	*2.5-5 mg daily*	*5-20 mg daily*	*20 mg daily*	*$128-$210*
Spironolactone	*25mg daily*	*50-100 mg daily in*	*100 mg daily*	*$27-$43*

Aldactone® (use as an add-on only)		*single or divided doses*		
Torsemide Soaanz®	*5 mg daily*	*5-10 mg daily*	*10 mg daily*	*$20*
Centrally Acting Agents				
Clonidine	*0.1 mg twice daily*	*0.2-0.6 mg twice daily*	*2.4 mg daily in divided doses*	*$5-$76*
Clonidine Catapres TTS®	*0.1 mg patch every 7 days*	*0.1-0.3 mg patch every 7 days*	*0.6 mg patch every 7 days*	*$313-$732*
Guanfacine	*0.5-1 mg every night*	*1-2 mg every night*	*3 mg every night*	*$38-$60*
Methyldopa	*250 mg 2-3 times a day*	*250 mg – 1000mg daily in 2-4 divided doses*	*3000 mg daily in divided doses*	*$270-$720*
Vasodilator				
Hydralazine	*10 mg 4 times daily consistently with or without food*	*100-200 mg daily in divided doses*	*200 mg daily in divided doses*	*$30-$61*
Renin Inhibitor				
*Aliskiren** Tekturna®*	*150 mg daily*	*150-300 mg daily*	*300 mg daily*	*$234-$296*
Antihypertensive Combinations				
Drug Name	***Components***	***Normal Maintenance Dose***		***Cost (30 day)***
Accuretic®	*Quinapril/ HCTZ*	*5/6.25-40/25 daily*		*$86-$346*
HCTZ/spironolactone	*HCTZ/spironolactone*	*50/50-100/100 daily*		*$130-$260*
Atacand HCT®	*Candesartan/HCTZ*	*Follow dosing for individual components*		*$141-$156*
Avalide®	*Irbesartan/HCTZ*	*150/12.5 – 300/12.5 daily*		*$112-$121*
Azor®	*Amlodipine/ olmesartan*	*5/20-10/40 daily*		*$235-$298*
Benicar HCT®	*Olmesartan/HCTZ*	*Follow dosing for individual components*		*$207-$288*
Diovan HCT®	*Valsartan/HCTZ*	*160/12.5-320/25 daily*		*$128-$184*
Metoprolol /HCTZ	*Metoprolol /HCTZ*	*Follow dosing instructions for individual components*		*$42-$70*
Maxzide®	*HCTZ/triamterene*	*25/37.5-50/75 daily*		*$12-$33*
Edarbyclor	*Azilsartan/ chlorthalidone*	*40/12.5 – 40/25 daily*		*$293 (brand only)*
Exforge®	*Amlodipine/valsartan*	*5/160-10/320 daily*		*$164-$236*
Exforge/HCT®	*Amlodipine/valsartan/ HCTZ*	*Follow dosing for individual components*		*$287-$413*

Fosinopril/ HCTZ	*Fosinopril/HCTZ*	*Follow dosing for individual components*	*$93*
Hyzaar®	*HCTZ/losartan*	*Follow dosing for individual components*	*$75-$102*
Propranolol / HCTZ	*Propranolol / HCTZ*	*Follow dosing for individual components*	*$34-$42*
Lotensin HCT®	*Benazepril/HCTZ*	*Follow dosing for individual components*	*$62*
Lotrel®	*amlodipine/benazepril*	*Follow dosing for individual components*	*$80-$146*
Micardis HCT®	*Telmisartan/HCTZ*	*Follow dosing for individual components*	*$145-$165*
Amiloride/ HCTZ	*HCTZ/amiloride*	*1-2 tablets every day with meals (50mg/5mg)*	*$35-$70*
Prestalia ®	*Perindopril/ amlodipine*	*3.5/2.5-14/10 daily*	*$204 (brand only)*
trandolapril/ verapamil	*trandolapril/ verapamil*	*1/180 – 4/240 daily*	*$175*
Aliskiren/HCTZ	*Aliskiren/HCTZ*	*Follow dosing for individual components*	*$404*
Tenoretic®	*atenolol/ chlorthalidone*	*Follow dosing for individual components*	*$93*
Tribenzor®	*Amlodipine/ olmesartan/ HCTZ*	*Follow dosing for individual components*	*$235-$297*
Telmisartan/ amlodipine	*Telmisartan/ amlodipine*	*Follow dosing for individual components*	*$171*
Vaseretic®	*HCTZ/enalapril*	*10/25-20/50 daily*	*$33-$73*
Zestoretic®	*HCTZ/lisinopril*	*Follow dosing for individual components*	*$34-$37*
bisoprolol/HCTZ	*bisoprolol/HCTZ*	*Follow dosing for individual components*	*$221*
Captopril/HCTZ	*Captopril/HCTZ*	*25/15 – 150/50 daily*	*$86-$147*
Methyldopa/HCTZ	*Methyldopa/HCTZ*	*Follow dosing for individual components*	*$55-$65*

** The different diltiazem products are not all equivalent. Currently, only Cardizem CD and Cartia XT are equivalent and can be substituted for one another. All other diltiazem products are not equivalent to each other and therefore cannot be substituted for one another.*

***Aliskiren and aliskiren-containing products should not be used with ACE inhibitors or ARBs in diabetic patients.*

****Valturna should not be used in diabetic patients*

Use of Self-Measured Blood Pressures (SMBP) in Hypertension

Introduction

Self-management of diabetes has become a common and accepted part of care. Patient self-measured blood pressure is a parallel strategy that allows patients to become more involved in their care and to better understand their disease. Evidence from systematic reviews shows that home blood pressures correlate with ambulatory blood pressure monitoring and have a better association with CV outcomes than office blood pressures[6]. Their use can result in a small reduction in BP (in comparison to usual care) of about 2.5 mmHg systolic and 1.8 mmHg diastolic[7]. In addition, home blood pressure monitoring is more practical than ambulatory monitoring, and similarly allows diagnosis of white-coat or masked hypertension, improving accuracy of office BPs in diagnosis and treatment.

Definition of terms

OBP – Office blood pressure management – Typical way in which HTN is measured using manual BP cuff.

AOBP/AOPM – Automated office blood pressure/Automated office pressure measurement – Historical way in which HTN was measured in studies, now increasingly used in offices where available.

ABP/ABPM – Ambulatory blood pressure measurement. Definitive method to monitor hypertension. Requires referral and office to set up and interpret.

HBP/HBPM – Home blood pressure measurement. Increasing evidence points to usefulness in management and diagnosis.

SMBP – Self-measured/managed blood pressure using HBPM. Involvement of the patient in taking and monitoring blood pressures with subsequent clinician review.

Recommendations

When to Use

Use in initial diagnosis of HTN.

- The USPSTF recommends "obtaining measurements outside of the clinical setting for diagnostic confirmation before starting treatment." [8]They found that ABPM is the most accurate method for making a diagnosis, but that HBPM may be an acceptable alternative.

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[6] Shimbo D, Abdalla M, Falzon L, et al. Role of Ambulatory and Home Blood Pressure Monitoring in Clinical Practice. Ann Intern Med. 2015; 163:691-700. doi:10.7326/M15-127.

[7] Glynn LG, Murphy AW, Smith SM, Schroeder K, Fahey T. Interventions used to improve control of blood pressure in patients with hypertension. Cochrane Database of Systematic Reviews 2010, Issue 3. Art. No.: CD005182. DOI: 10.1002/14651858.CD005182.pub4

[8] Final Recommendation Statement High Blood Pressure in Adults: Screening. USPSTF. Available from https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/high-blood-pressure-in-adults-screening, accessed 2/11/2024.

- Similarly, the 2017 ACC/AHA HTN guideline states "Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension." [9]

Use in monitoring HTN Treatment
ACC/AHA HTN guideline recommends "out-of-office BP measurements are recommended…for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions."

How to use
Choose an appropriate BP monitoring device[10]

Automated	Manual
Upper arm cuff	Wrist or finger cuff
Validated by AAMI, BHS, or EHS	Not validated
Memory storage capacity	No memory storage
Accuracy checked by physician or nurse after purchase	Patient uses monitor without consulting physician

A list of validated cuffs can be found at the US Blood Pressure Validated Device Listing https://www.validatebp.org/ (choose Device Type= "Home")

Instruct the patient and make sure the patient is measuring accurately[11]
Training – Patients should receive a brief training by a health care provider about hypertension, choosing an appropriate cuff, and best practice for measurement.

Best practices in measurement include:
- Sitting with feet flat on the floor, arm supported at heart level, back supported in a chair.
- Place cuff on bare arm – not over clothing.
- Rest for 5 minutes.
- Don't move or talk during measurement.
- Take several readings at least 1 minute apart. Ideally take BP daily or record weekly "2 weeks after a change in treatment and before a clinic visit."[8]
- Bring your monitor with recorded bps to your doctor's office.
- Videos can be viewed at**:** https://youtu.be/0tGyRJxbYpQ or https://youtu.be/I7XxfmDjyEg

[9] Whelton PK, Carey RM, Aronow WS, et al, 2017. ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults, Journal of the American College of Cardiology (2017),
doi: 10.1016/j.jacc.2017.11.006
[10] Centers for Disease Control and Prevention. Self-Measured Blood Pressure Monitoring: Action Steps for Public Health Practitioners. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services; 2013.
[11] 2017 ACC/AHA HTN Guideline, Table 10, p 30

Interpretation of results
As based on an equivalent CV risk, equivalent blood pressures are specified in the 2017 guideline as follows[12]:

Clinic BP	HBP	24-hr ABPM
120/80	120/80	115/75
130/80	130/80	125/75
140/90	135/85	130/80
160/100	145/90	145/90

Based on the 2022 Hypertension Quality Measure, a blood pressure taken by a patient and conveyed to the clinician may count toward the measure[13]. Workflow guidance on how to enter this measure in MedConnect will be provided separately.

Use to identify masked and white coat HTN.
Home blood pressures can vary significantly from office BPs. Differences from office BPs can confirm or refute several situations:

		Home BP	
		High	Normal
Office BP	High	Confirmed HTN	White-coat effect
	Normal	Masked HTN	No HTN

CV risk for masked HTN is thought to be similar to that for HTN overall, while that for white coat hypertension is felt to be minimally increased.[14]

Protocols from the 2017 ACC/AHA HTN Guideline

For those that are following the above guideline, specific flow charts are included in the guideline for diagnosing and managing white coat and masked hypertension. Due to copyright restrictions, they are not reprinted here. For actual algorithms, please see the guideline.

Summary of the algorithms is as follows for patients NOT on drug therapy:

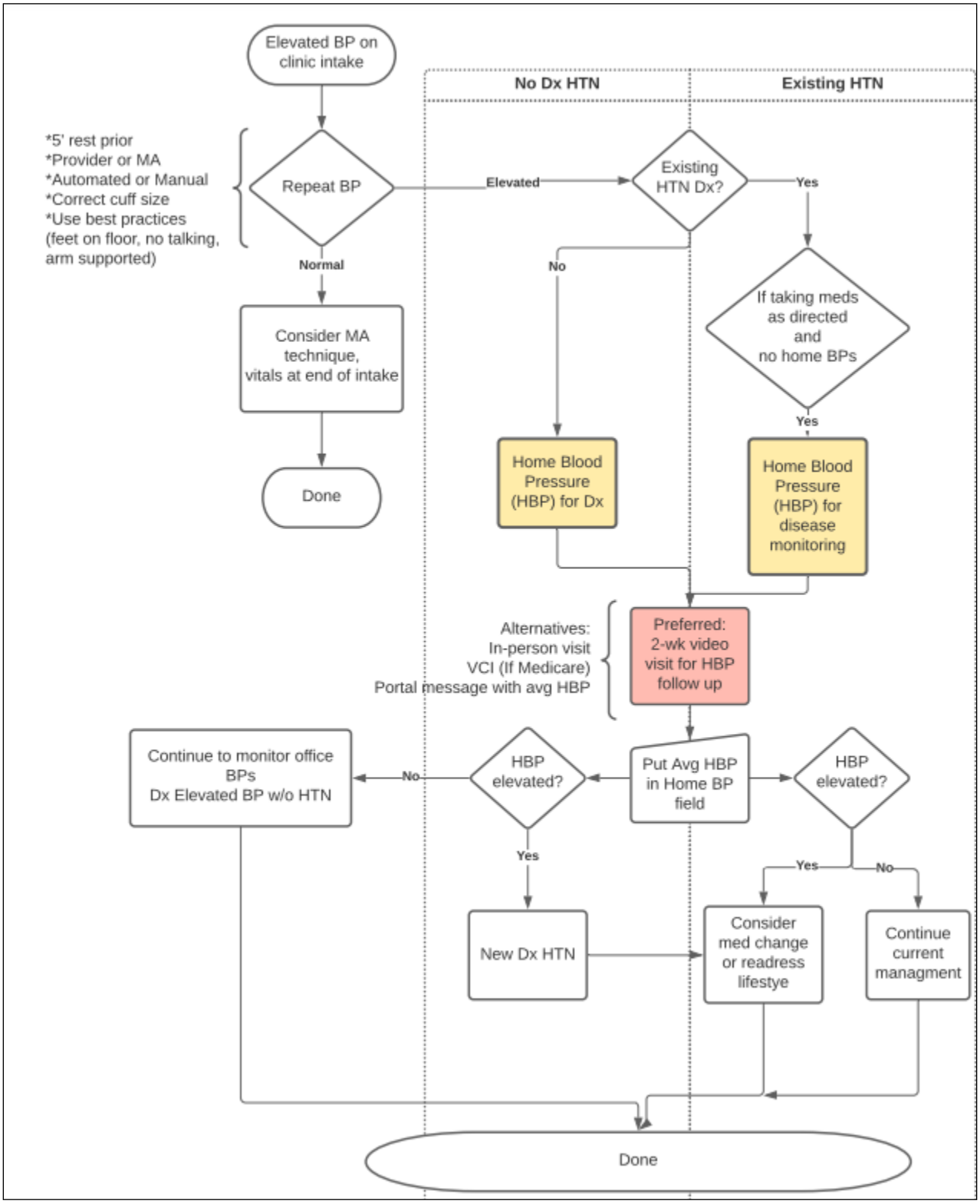
Office BP ≥130/80 but <160/100 after 3-month trial of lifestyle with suspected white coat effect
HBPM < 130/80?
Yes → Confirmation of white coat effect. Continue lifestyle modification and repeat HBPM in 1 year.
No → Confirms hypertension, continue lifestyle, start medication.

[12] 2017 ACC/AHA HTN Guideline, section 4.2, See Table 11, p 29.
[13] Controlling High Blood Pressure. eCQI Resource Center, CMS Measure ID CMS 165v10. Available from https://ecqi.healthit.gov/ecqm/ep/2022/cms165v10, accessed 03/17/2024.
[14] 2017 ACC/AHA HTN Guideline, section 4.4, p 33, also see Table 12.

Office BP 120-129/<80 after 3-month trial of lifestyle with suspected masked hypertension
HBPM ≥130/80?
Yes → Confirmation of masked hypertension, continue lifestyle, start medication.
No → Elevated bp w/o hypertension dx, continue lifestyle modification and recheck HBP in 1 year to detect masked hypertension.

For patients on anti-hypertensive therapy:
If office BP is at goal
If at increased risk of CVD risk or target-organ damage, screen for masked hypertension and intensify therapy if present.

If office BP ≥5-10 mm above goal on ≥3 agents
Screen for white coat effect – If HBPM at goal – White coat effect (confirm with ABPM)
If HBPM not at goal – continue to titrate (treat based on HBP)



Initial Approval Date and Reviews:	Most Recent Revision and Approval Date:	Next Scheduled Review Date:
10/98, revised 10/00, 7/03, 7/04, 8/06. 4/09, 4/10, 4/12, 4/14, 3/16, 3/18, 3/20, 3/22 by Ambulatory Quality Best Practice Committee	**March 2024**	March 2026 Ambulatory Best Practice