



## 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.*

**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 American College of Cardiology/American Heart Association (ACA/AHA) updated its guideline for Hypertension management in November of 2017. The new guideline, 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 has not been achieved. This guideline 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 new ACC/AHA guideline, hypertension is defined as a systolic blood pressure (SBP) of  $\geq 130$  and diastolic blood pressure (DBP) of  $\geq 80$ , instead of the previous definition of  $\geq 140/90$ . 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 will greatly increase 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 new guideline stresses these lifestyle style modifications as an important part of the overall treatment plan.

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**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.

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Screening for hypertension is recommended by the USPSTF (Grade A recommendation) for adults aged 18 and over. Screening is recommended annually for adults age 40 and over and those who are at increased risk for high blood pressure. Screening is recommended every 3-5 years for 18-39 year olds with prior normal blood pressure and no risk factors.<sup>1</sup> 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	<p>Hypertension Stage 1:</p> <p>Assess the 10-year risk for heart disease and stroke using the <u><a href="#">atherosclerotic cardiovascular disease (ASCVD) risk calculator</a></u>. <u>This tool is available as:</u></p> <ul style="list-style-type: none"> <li>• <u><a href="#">A phone app for iOS or Android</a></u></li> <li>• <u><a href="http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/">Online at <a href="http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/">http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/</a></a></u></li> <li>• <u><a href="#">In MedConnect – ASCVD Risk Estimator component</a></u></li> </ul> <p>If risk is less than 10%, start with healthy lifestyle recommendations and reassess in 3-6 months.</p> <p>If risk is greater than 10% or the patient has known clinical cardiovascular disease (CVD), diabetes mellitus, or chronic</p>

1. **Internet Citation:** Final Recommendation Statement: High Blood Pressure in Adults: Screening. U.S. Preventive Services Task Force. September 2017.

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

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  $\geq 130/80$  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  $\geq 130/80$  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  $\geq 130/80$  would indicate masked hypertension in those patients. See Appendix 3.

**II. Medical Evaluation after Diagnosis of Hypertension**

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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

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### 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-assessed 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 months 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).

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**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.<sup>2</sup> 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.

**BP Targets—JNC 8, 2014**

	<i>Age 18-59</i>	<i>Age 60-85</i>
<i>Diabetes Mellitus, Chronic Kidney Disease</i>	<i>&lt; 140/90</i>	
<i>No Diabetes Mellitus</i>	<i>&lt; 140/90</i>	<i>&lt;150/90</i>

**Other Optional Treatment Goals**

The recent SPRINT trial,<sup>3</sup> 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.**

<sup>2</sup> 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>.

<sup>3</sup> The SPRINT Research Group. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. N Engl J Med 2015; 373:2103-2116 November 26, 2015 DOI: 10.1056/NEJMoa1511939. Available from <http://www.nejm.org/doi/full/10.1056/NEJMoa1511939>.

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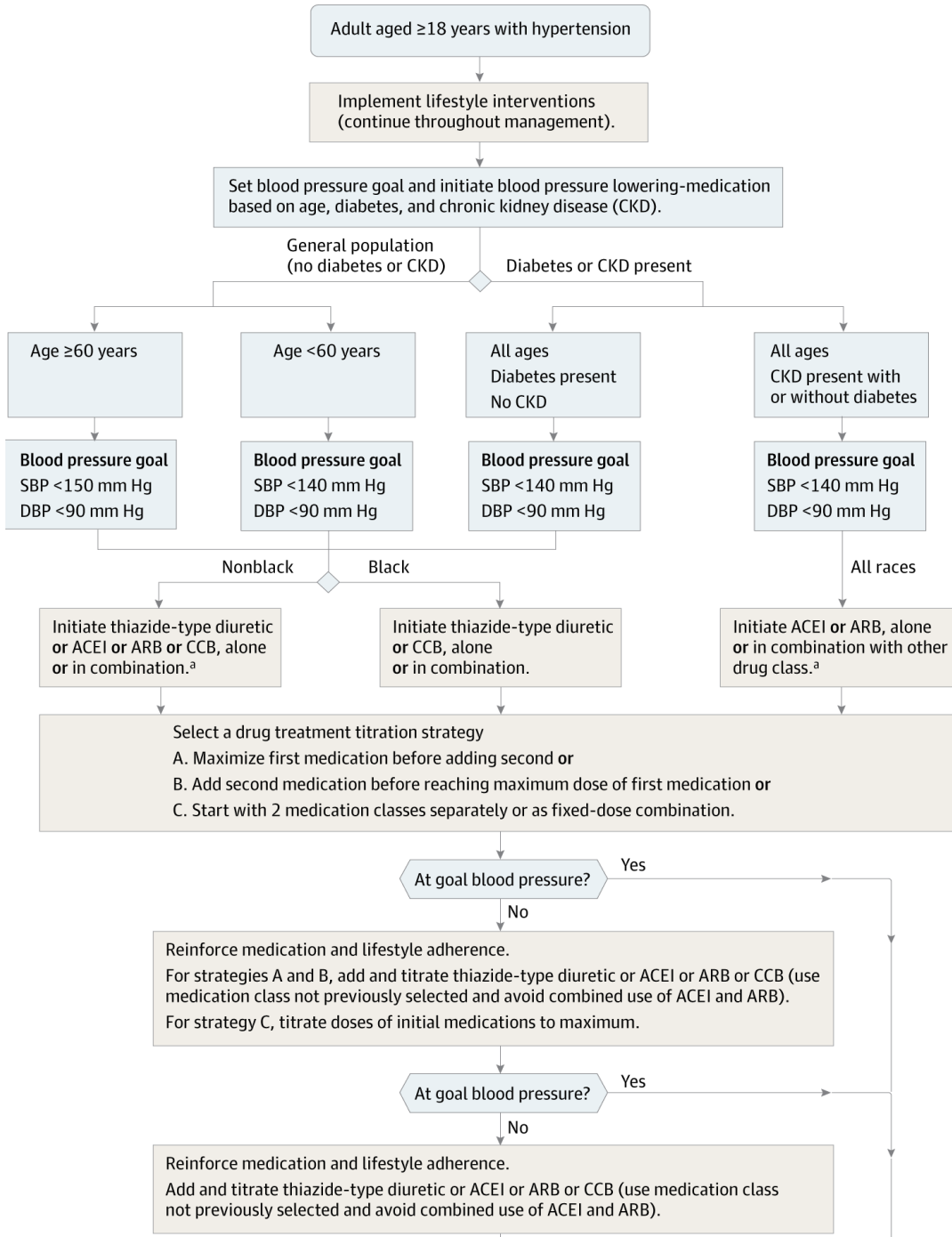
**Medication Choice in Hypertension Management**

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.

**JNC 8 Treatment Algorithm**

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**Compelling Indications—JNC 7**

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

Abbreviations: ACE, angiotension- converting enzyme; ARB, angiotension-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.

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**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 <sup>2</sup> ; for non-overweight persons, maintain desirable BMI <25 kg/m <sup>2</sup>
Reduced salt intake	<ul style="list-style-type: none"> <li>• Consume no more than 2400 mg of sodium/day</li> <li>• Further reduction of sodium intake to 1500 mg/d can result in even greater reduction in BP</li> <li>• Even without achieving these goals, reducing sodium intake by at least 1000 mg/d lowers BP</li> </ul>
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**

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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**

<b>Condition</b>	<b>Recommended Follow-up Interval</b>
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; 301-592-8573);

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

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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)
- 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
- Treatment of Hypertension in Patients with Coronary Artery Disease: A Scientific Statement from AHA, ACC, and ASH. Circulation 2015; 131:e435-e470.
- 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. Hypertension 2017 November13 (Epub ahead of print)
- Aram V. Chobanian, et al. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.  
<http://hyper.ahajournals.org/content/hypertensionaha/42/6/1206.full.pdf>

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**IX. Appendices:**

1. Dash Diet –Page 17-22
2. Detailed list of pharmacologic agents–Page 23-38
3. Use of Self-Measured Blood Pressures (SMBP) in Hypertension- Page 39

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**The DASH Diet**

**(Dietary Approaches to Stop Hypertension)**

<b>Food Group</b>	<b>Daily Serving</b>	<b>Serving Size</b>	<b>Examples and Notes</b>	<b>Significance in the DASH Diet Pattern</b>
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	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter,	Rich sources of energy, magnesium, potassium,

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		2 Tbsp or ½ oz seeds ½ cup cooked legumes (dry beans and peas)	kidney beans, lentils, split peas	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 [http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new\\_dash.pdf](http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf) Retrieved from [http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new\\_dash.pdf](http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf) the results show that the DASH “combination diet” lowered blood pressure and, may help prevent and control high blood pressure. The “combination diet” is rich in fruits, vegetables, and 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, the number of daily servings in a food group may vary from those listed.

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**The DASH Diet Sodium Table**

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

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- 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.

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## The DASH Diet Potassium Tab

Potassium Table - Food Group	Examples	Potassium (mg)
Vegetables	Potato, 1 medium	926 mg
	Sweet Potato, 1 medium	540 mg
	Spinach, cooked, 1/2 cup	290 mg
	Zucchini, cooked, 1/2 cup	280 mg
	Tomato, fresh, 1/2 cup	210 mg
	Kale, cooked, 1/2 cup	150 mg
	Romaine lettuce, 1 cup	140 mg
	Mushrooms, 1/2 cup	110 mg
	Cucumber, 1/2 cup	80 mg
Fruit	Banana, 1 medium	420 mg
	Apricots, 1/4 cup	380 mg
	Orange, 1 medium	237 mg
	Cantaloupe chunks, 1/2 cup	214 mg
	Apple, 1 medium	150 mg
Low-fat or fat-free milk and milk products	Milk, 1 cup	380 mg
	Yogurt, 1 cup	370 mg
Nuts, seeds, and legumes	Cooked soybeans, 1/2 cup	440 mg
	Cooked lentils, 1/2 cup	370 mg
	Cooked kidney beans, 1/2 cup	360 mg
	Cooked split peas, 1/2 cup	360 mg
	Almonds, roasted, 1/3 cup	310 mg
	Walnuts, roasted, 1/3 cup	190 mg

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	Sunflower seeds, roasted, 2 Tbsp	124 mg
	Peanuts, roasted, 1/3 cup	120 mg
Lean meats, fish, and poultry	Fish (cod, halibut, rockfish, trout, tuna), 3 oz	200–400 mg
	Pork tenderloin, 3 oz	370 mg
	Beef tenderloin, chicken, turkey, 3 oz	210 mg

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## Pharmacological Therapy

### Detailed List

Cost reflects 30-day supply for normal maintenance dose based on AWP (Lexicomp Online). 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.

<b>Drug Name/Class</b>	<b>Starting Dose</b>	<b>Maintenance Dose</b>	<b>Maximum Dose</b>	<b>Cost (30 day)</b>
<b>ACE Inhibitors</b>				
<i>Benazepril Lotensin<sup>®</sup></i>	<i>10 mg every day  5 mg once daily in patients also taking a diuretic  CrCl&lt;30: 5 mg daily</i>	<i>20-40 mg daily in 1- 2 divided doses</i>	<i>80 mg every day  CrCl&lt;30: 40 mg daily Hemodialysis or peritoneal dialysis: 25-50% of usual dose</i>	<i>\$30</i>
<i>Captopril</i>	<i>25 mg 2-3 times a day  Cr cl 10-50: 75% of normal dose every 12-18 hrs  Cr cl &lt; 10: 50% of normal dose every 24 hrs  *always administer at least 1 hr before meals</i>	<i>25- 50 mg mg 2 -3 times a day</i>	<i>150 mg 3 times a day  Peritoneal dialysis: 50% of normal dose every 24 hours  Hemodialysis: administer after dialysis on dialysis days</i>	<i>\$52-\$172</i>
<i>Enalapril Vasotec<sup>®</sup> Epaned<sup>®</sup> (oral solution)</i>	<i>5 mg daily.  (if on diuretic start at 2.5 mg daily)  CrCl&lt;30: 2.5 mg daily  Hemodialysis 2.5 mg on dialysis days</i>	<i>20 mg daily in 1-2 divided doses</i>	<i>40 mg every day</i>	<i>\$30-\$83  Epaned: \$4.20/mL (brand only)</i>

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<i>Fosinopril</i>	<i>10 mg daily</i>	<i>20-40 mg daily</i>	<i>80 mg daily</i>	<i>\$14-\$36</i>
<i>Lisinopril</i> <i>Zestril®</i> , <i>Prinivil®</i> , <i>Obrelis® (oral solution)</i>	<i>10 mg daily (if not on diuretic, if on diuretic, initiate at 5 mg daily)</i>  <i>CrCl 10-30: 5 mg daily</i> <i>CrCl &lt;10: 2.5 mg daily</i> <i>Hemodialysis: 2.5 mg daily</i>	<i>20-40 mg daily</i>	<i>40 mg daily</i>	<i>\$2-\$47</i>  <i>Obrelis: \$4/.30/mL (brand only)</i>
<i>Moexipril</i>	<i>7.5 mg daily 1 hr before meals (if on diuretic, start at 3.75 mg daily)</i>  <i>CrCl &lt;40: 3.75 mg daily</i>	<i>7.5-30 mg in 1-2 divided doses 1 hr before meals</i>	<i>60 mg daily</i>  <i>CrCl &lt;40: 15 mg daily</i>	<i>\$56-\$88</i>
<i>Perindopril</i>	<i>4 mg daily,</i> <i>CrCl &gt;30: 2 mg daily</i>  <i>CrCl &lt;30, use not recommended</i> <i>Hemodialysis: 2 mg on dialysis days—given after dialysis</i>	<i>4-8 mg daily in 1-2 divided doses</i>	<i>16 mg daily</i>  <i>8 mg daily in adults &gt; 65 yo and in renal impairment with Cr Cl ≥30</i>	<i>\$26-\$84</i>
<i>Quinapril</i> <i>Accupril®</i>	<i>10-20 mg daily</i>  <i>CrCl 30-60 5 mg daily</i> <i>CrCl 10-30 2.5 mg daily</i>	<i>20-40 mg daily in 1-2 divided doses</i>	<i>80 mg daily</i>	<i>\$37</i>
<i>Ramipril</i> <i>Altace®</i>	<i>2.5 mg daily</i>  <i>CrCl &lt;40 1.25mg daily</i>	<i>2.5-20 mg daily in 1 or 2 divided doses</i>	<i>20 mg daily</i>  <i>CrCl &lt;40: 5 mg daily</i>	<i>\$51-133</i>
<i>Trandolapril</i>	<i>1-2 mg every day</i>  <i>CrCl &lt;30: 0.5 mg daily</i>	<i>2-4 mg daily</i>	<i>8 mg daily in 2 divided doses</i>	<i>\$37</i>
<b>Angiotensin Receptor Blockers</b>				
<i>Azilsartan</i>	<i>40 – 80 mg daily</i>	<i>80 mg daily</i>	<i>80 mg daily</i>	<i>\$235-\$256</i>

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<i>Edarbi</i> <sup>®</sup>	<i>(40 mg daily in volume-depleted patients)</i>			<i>(brand only)</i>
<i>Candesartan</i> <i>Atacand</i> <sup>®</sup>	<i>8 mg daily</i>	<i>8-32 mg daily in 1-2 divided doses</i>	<i>32 mg daily</i>	<i>\$100-\$134</i>
<i>Eprosartan</i>	<i>600 mg daily</i>	<i>400-800 mg daily in 1-2 divided doses</i>	<i>800 mg daily in 1-2 divided doses</i>	<i>\$103</i>
<i>Irbesartan</i> <i>Avapro</i> <sup>®</sup>	<i>150mg daily (75 mg daily in volume-depleted patients)</i>	<i>150-300 mg daily</i>	<i>300 mg daily</i>	<i>\$14-\$111</i>
<i>Losartan</i> <i>Cozaar</i> <sup>®</sup>	<i>50 mg daily</i>	<i>100 mg daily in 1-2 divided doses</i>	<i>100 mg daily</i>	<i>\$68-\$99</i>
<i>Olmesartan</i> <i>Benicar</i> <sup>®</sup>	<i>20 mg daily</i>	<i>20-40 mg daily</i>	<i>40 mg daily</i>	<i>\$188-\$288</i>
<i>Telmisartan</i> <i>Micardis</i> <sup>®</sup>	<i>20-40 mg daily</i>	<i>40-80 mg daily</i>	<i>80 mg daily</i>	<i>\$130-\$175</i>
<i>Valsartan</i> <i>Diovan</i> <sup>®</sup>	<i>80-160 mg daily</i> <i>80 mg daily in volume-depleted patients</i>	<i>160-320 mg daily</i>	<i>320 mg daily</i>	<i>\$197</i>

**Beta Blockers**

<i>Acebutolol</i>	<i>200-400 mg in 1-2 divided doses</i>  <i>CrCl 25-49: reduce dose by 50%</i>  <i>CrCl &lt; 25: reduce dose by 75%</i>	<i>400-800 mg in 1-2 divided doses</i>	<i>1200 mg/day in 2 divided doses</i>	<i>\$40-\$116</i>
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<i>Atenolol</i> <i>Tenormin</i> <sup>®</sup>	<i>25-50 mg daily</i>	<i>50-100 mg daily</i>	<i>100 mg daily</i> <i>CrCl 15-35: 50 mg daily</i> <i>CrCl &lt;15: 25 mg daily</i> <i>Hemodialysis: give after dialysis or give 25-50 mg supplemental dose after dialysis</i>	<i>\$24-\$45</i>
<i>Betaxolol</i>	<i>5-10 mg daily</i> <i>Hemodialysis: 5 mg dialysis</i>	<i>10-20 mg daily</i>	<i>20mg daily</i>	<i>\$37-\$80</i>
<i>Bisoprolol</i>	<i>2.5-5 mg daily</i> <i>CrCl &lt; 40: 2.5 mg daily</i>	<i>2.5-10 mg daily</i>	<i>20 mg daily</i>	<i>\$37-\$68</i>
<i>Metoprolol tartrate</i> <i>Lopressor</i> <sup>®</sup> <i>(immediate release)</i>	<i>50 mg 2 times a day</i>	<i>100-450 mg in 2-3 divided doses</i>	<i>450 mg daily in 2-3 divided doses</i>	<i>\$33 -\$82</i>
<i>Metoprolol succinate</i> <i>Toprol XL</i> <sup>®</sup>	<i>25-100 mg daily</i>	<i>100-200 mg daily</i>	<i>400 mg daily</i>	<i>\$9-\$92</i>
<i>Nadolol</i> <i>Corgard</i> <sup>®</sup>	<i>40 mg daily</i> <i>CrCl 31-50: give every 24-36 hrs</i> <i>CrCl 10-30: give every 23-48 hrs</i> <i>Hemodialysis: give usual dose after dialysis</i>	<i>40-120 mg daily</i>	<i>320 mg daily</i>	<i>\$120-\$651</i>

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<i>Nebivolol</i> <i>Bystolic</i> <sup>®</sup>	<i>5 mg daily</i> <i>2.5 mg daily if CrCl &lt;30</i>  <i>Moderate hepatic impairment: 2.5 mg daily.</i>  <i>Severe hepatic impairment: contraindicated</i>	<i>5-10 mg daily</i>	<i>40 mg daily</i>	<i>\$181 (brand only)</i>
<i>Pindolol</i>	<i>5 mg 2 times a day</i>	<i>5- 20 mg 2 times a day</i>	<i>60 mg daily in 2-3 divided doses</i>	<i>\$66-648</i>
<i>Propranolol</i> <i>Inderal</i> <sup>®</sup>	<i>IR: 40 mg 2 times a day on an empty stomach</i>	<i>IR: 120-240 mg daily in 2-3 divided doses</i>	<i>IR: 640 mg daily</i>	<i>\$52-\$216</i>
<i>Propranolol</i> <i>Inderal LA</i> <sup>®</sup> <i>Inderal XL</i> <sup>®</sup> <i>InnoPranXL</i> <sup>®</sup>	<i>Inderal LA: 80 mg daily</i>  <i>XL forms: 80 mg daily at bedtime</i>  <i>Give consistently with or without food</i>	<i>LA: 120-160 mg daily</i>  <i>XL: 80-120 mg daily</i>	<i>LA: 640 mg daily</i>  <i>XL: 120 mg daily</i>	<i>\$71-\$466</i>  <i>(generic for Inderal LA \$906)</i>  <i>(both XL forms available in brand name only)</i>
<b><i>Alpha Blockers</i></b>				
<i>Doxazosin</i> <i>Cardura</i> <sup>®</sup> <i>Immediate release</i>	<i>1 mg</i>  <i>*if therapy is stopped for several days, restart with 1 mg and titrate up</i>	<i>1-2 mg daily</i>	<i>16 mg daily</i>	<i>\$8-\$89</i>
<i>Prazosin</i> <i>Minipress</i> <sup>®</sup>	<i>1 mg 2 or 3 times a day</i>	<i>6-15 mg daily in divided doses</i>	<i>40 mg daily in divided doses</i>	<i>\$85-\$550</i>

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<i>Terazosin</i>	<i>1 mg every night</i>	<i>1-2 mg every night</i>  <i>*may use twice daily dosing if response diminished at 24 hrs</i>	<i>20 mg every night</i>	<i>\$48-\$96</i>
<b><i>Alpha-Beta Blockers</i></b>				
<i>Carvedilol</i>	<i>6.25 mg 2 times a day IR</i>	<i>6.25-12.5 mg 2 times a day (IR)</i>	<i>25 mg 2 times a day (IR)</i>	<i>\$128 IR</i>
<i>Coreg®</i>	<i>20 mg daily for CR</i>	<i>20-40 mg daily (CR)</i>	<i>80 mg daily for CR</i>	<i>\$309 CR</i>
<i>Coreg CR®</i>				
<i>Labetalol</i>	<i>100 mg 2 times a day</i>	<i>200-600 mg 2 times a day</i>	<i>1200 mg 2 times a day</i>	<i>\$34-\$254</i>
<i>Trandate</i>				
<b><i>Calcium Channel Blockers</i></b>				
<i>Amlodipine</i>	<i>5 mg daily</i>	<i>2.5-10 mg daily</i>	<i>10 mg daily</i>	<i>\$53-\$72</i>
<i>Norvasc®</i>	<i>(2.5 mg daily in frail, small patients, when added to other antihypertensives, and in severe hepatic impairment)</i>			
<i>Diltiazem</i>	<i>180-240 mg daily</i>	<i>240-360 mg daily</i>	<i>480mg daily</i>	<i>\$1532-\$8781 (Cardizem CD)</i>
<i>Cardizem CD®</i>				<i>\$61-\$71 (Cartia XT)</i>
<i>Cartia XT®</i>				
<i>Diltiazem</i>	<i>180-240 mg daily</i>	<i>240-360 mg daily</i>	<i>540 mg daily</i>	<i>\$114-\$171</i>
<i>Dilt XR®</i>				

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<i>Diltiazem</i> <i>Tiazac</i> <sup>®</sup> <i>Taztia XT</i>	<i>120-240 mg daily</i>	<i>240-360 mg daily</i>	<i>540 mg daily</i>	<i>\$121-\$160 (Tiazac)</i> <i>\$59-\$77 (Taztia XT)</i>
<i>Diltiazem</i> <i>Cardizem LA</i> <sup>®</sup> <i>Matzim LA</i> <sup>®</sup>	<i>180-240 mg daily</i>	<i>240-360 mg daily</i>	<i>540 mg daily</i>	<i>\$162-\$227 (Cardizem LA)</i> <i>\$100-\$140 (Matzim LA)</i>
<i>Felodipine</i>	<i>2.5 mg - 5 mg daily</i> <i>(2.5 mg in hepatic impairment)</i>	<i>2.5-10 mg daily</i>	<i>10 mg daily</i>	<i>\$37-\$112</i>
<i>Isradipine</i>	<i>2.5 mg 2 times a day</i>	<i>5-10 mg in 2 divided doses</i>	<i>10 mg in 2 divided doses</i> <i>5 mg in 2 divided doses in older patients</i>	<i>\$82 - \$120</i>
<i>Nicardipine</i>	<i>20 mg 3 times a day</i>	<i>20-40 mg 3 times a day</i>	<i>40 mg 3 times a day</i>	<i>\$200-\$287</i>
<i>Nifedipine extended release</i> <i>Adalat CC / Procardia XL /</i>	<i>Procardia XL: 30-60 mg once daily</i> <i>Adalat CC: 30 mg once daily</i>	<i>30-90 mg daily</i>	<i>Procardia XL: 120 mg daily</i> <i>Adalat CC: 90 mg daily</i> <i>*three 30 mg tabs are not equivalent to a 90 mg tab, but two 30 mg tabs are equivalent to a 60 mg tab</i>	<i>\$64-\$126 (Adalat CC)</i> <i>\$223-\$445 (Procardia XL)</i>
<i>Nisoldipine</i> <i>Sular</i> <sup>®</sup>	<i>17 mg daily at the same time each day on an empty stomach. (8.5 mg daily in geriatric patients and in hepatic impairment)</i>	<i>17-34 mg daily</i>	<i>34 mg daily</i>	<i>\$905 (brand only)</i>
<i>Nisoldipine Extended</i>	<i>20 mg at the same time each day on an empty</i>	<i>20-40 mg daily</i>	<i>60 mg daily</i>	<i>\$494-\$538</i>

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<i>Release</i>	<i>stomach (10 mg daily in geriatric patients and in hepatic impairment)</i>			
<i>Verapamil</i>	<i>80 mg 3 times a day</i>	<i>240-480 mg in 3 times a day</i>	<i>480 mg in 3 divided doses</i>	<i>\$51-\$90</i>
<i>Verapamil</i> <i>Calan SR<sup>®</sup></i> <i>Verelan<sup>®</sup></i> <i>Verelan PM<sup>®</sup></i>	<i>Calan SR: 180 mg every morning with food</i>  <i>Verelan: 120 mg every morning</i>  <i>Verelan PM: 200 mg at bedtime</i>  <i>*generic same dosing as Calan SR</i>	<i>Calan SR and Verelan: 240 mg twice daily</i>  <i>Verelan PM: 200-400 mg at bedtime</i>	<i>Calan SR and Verelan: 480 mg daily in divided doses (divide doses &gt; 240 mg daily)</i>  <i>Verelan PM: 400 mg at bedtime</i>	<i>\$68-\$318</i>
<b>Diuretics</b>				
<i>Bumetanide</i> <i>Bumex<sup>®</sup></i>	<i>1 mg daily</i>	<i>1 mg daily</i>	<i>1 mg daily</i>	<i>\$81</i>
<i>Chlorthalidone</i>	<i>12.5-25 mg daily</i>	<i>25-50 mg daily</i>	<i>100 mg daily</i>	<i>\$35-\$89</i>
<i>Chlorothiazide</i> <i>Diuril<sup>®</sup></i>	<i>500-1000 mg every day in 1-2 divided doses</i>	<i>500-1500 mg every day in 1-2 divided doses</i>	<i>2000 mg every day in 1-2 divided doses</i>	<i>\$37-\$112</i>
<i>Epleronone</i> <i>Inspra<sup>®</sup></i>	<i>25 - 50 mg daily</i>	<i>50 mg once daily to 50 mg twice daily</i>	<i>100 mg daily in divided doses</i>	<i>\$130-\$250</i>
<i>Furosemide</i> <i>Lasix<sup>®</sup></i>	<i>40 mg 2 times a day</i>	<i>40 mg 2 times a day</i>	<i>80 mg 2 times a day</i>	<i>\$10-\$25</i>
<i>Hydrochlorothi</i>	<i>12.5-25 mg daily</i>	<i>25-50 mg daily</i>	<i>50 mg daily</i>	<i>\$5 -\$25</i>

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<i>azide (HCTZ)</i>		<i>in 1-2 divided doses</i>		
<i>Indapamide</i>	<i>1.25 mg daily</i>	<i>1.25 – 2.5 mg daily</i>	<i>5 mg daily</i>	<i>\$20-\$46</i>
<i>Metolazone</i>	<i>2.5-5 mg daily</i>	<i>5-20 mg daily</i>	<i>20 mg daily</i>	<i>\$45-\$210</i>
<i>Spiro-lactone</i> <i>Aldactone®</i>	<i>50-100 mg every day in single or divided doses</i> <i>(25 mg daily if on other antihypertensives)</i>	<i>50-100 mg every day in single or divided doses</i>	<i>100 mg daily</i>	<i>\$25-\$43</i>
<i>Torsemide</i>	<i>5 mg daily</i>	<i>5-10 mg daily</i>	<i>10 mg daily</i>	<i>\$20</i>
<b><i>Centrally-Acting Agents</i></b>				
<i>Clonidine</i> <i>Catapres®</i>	<i>0.1 mg 2 times a day</i>	<i>0.2-0.6 mg 2 times a day</i>	<i>2.4 mg daily in divided doses</i>	<i>\$19-\$76</i>
<i>Clonidine</i> <i>Catapres TTS®</i>	<i>0.1 mg patch every 7 days</i>	<i>0.1-0.3 mg patch every 7 days</i>	<i>0.6 mg patch every 7 days</i>	<i>\$132-\$308</i>
<i>Guanfacine</i>	<i>0.5-1 mg every night</i>	<i>1-2 mg every night</i>	<i>3 mg every night</i>	<i>\$25-\$60</i>
<i>Methyldopa</i>	<i>250 mg 2-3 times a day</i>	<i>250 mg – 500 mg 2 times daily</i>	<i>3000 mg daily</i>	<i>\$22-\$40</i>
<b><i>Vasodilator</i></b>				
<i>Hydralazine</i>	<i>10 mg 4 times daily consistently with or without food</i>	<i>100-200 mg daily in divided doses</i>	<i>300 mg daily in divided doses</i>	<i>\$61-120</i>

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<b>Renin Inhibitor</b>				
<i>Tekturna (Aliskiren)**</i>	<i>150 mg daily</i>	<i>150-300 mg daily</i>	<i>300 mg daily</i>	<i>\$225-\$96  (brand only)</i>
<b>Antihypertensive Combinations</b>				
<b>Drug Name</b>	<b>Components</b>	<b>Normal Maintenance Dose</b>		<b>Cost (30 day)</b>
<i>Accuretic®</i>	<i>Quinapril/ HCTZ</i>	<i>10/12.5 or 20/12.5 daily</i>		<i>\$37</i>
<i>Aldactazide®</i>	<i>HCTZ/spironolactone</i>	<i>25/25 mg 2 tablets daily  50/50 mg 2 tablets daily</i>		<i>\$74-\$346  50/50 mg tab only available as brand</i>
<i>Atacand HCT®</i>	<i>Candesartan/HCTZ</i>	<i>Follow dosing for individual components</i>		<i>\$141-\$156</i>
<i>Avalide®</i>	<i>Irbesartan/HCTZ</i>	<i>150/12.5 – 300/12.5 daily</i>		<i>\$20-\$121</i>
<i>Azor®</i>	<i>Amlodipine/  olmesartan</i>	<i>5/20-10/40 daily</i>		<i>\$91-\$298</i>
<i>Benicar HCT®</i>	<i>Olmesartan/HCTZ</i>	<i>Follow dosing for individual components</i>		<i>\$190-\$288</i>
<i>Nebivolol/Valsartan</i>	<i>Valsartan/Nebivolol</i>	<i>80/5 daily</i>		<i>\$144</i>
<i>Capozide®</i>	<i>HCTZ/captopril</i>	<i>Follow dosing for individual components</i>		<i>\$86-\$147</i>
<i>Nadolol/bendroflumethiazide</i>	<i>Nadolol/bendroflumethiazide</i>	<i>40/5 -80/5 daily</i>		<i>\$140-\$280</i>
<i>Diovan HCT®</i>	<i>Valsartan/HCTZ</i>	<i>160/12.5-320/25 daily</i>		<i>\$118-\$184</i>
<i>Dutoprol®</i>	<i>Metoprolol succinate/HCTZ</i>	<i>Follow dosing instructions for individual components</i>		<i>\$263</i>
<i>Dyazide®  Maxzide®</i>	<i>HCTZ/triamterene</i>	<i>25/37.5-50/75 daily</i>		<i>\$12-\$33</i>

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<i>Edarbyclor</i>	<i>Azilsartan/ chlorthalidone</i>	<i>40/12.5 – 40/25 daily</i>	<i>\$242 (brand only)</i>
<i>Exforge<sup>®</sup></i>	<i>Amlodipine/valsartan</i>	<i>5/160-10/320 daily</i>	<i>\$164-\$240</i>
<i>Exforge/HCT<sup>®</sup></i>	<i>Amlodipine/valsartan/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$164-\$282</i>
<i>Fosinopril/ HCTZ</i>	<i>Fosinopril/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$46-\$117</i>
<i>Hyzaar<sup>®</sup></i>	<i>HCTZ/losartan</i>	<i>Follow dosing for individual components</i>	<i>\$75-\$102</i>
<i>Propranolol / HCTZ</i>	<i>Propranolol / HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$34-\$42</i>
<i>Lopressor HCT<sup>®</sup></i>	<i>HCTZ/metoprolol tartrate</i>	<i>Follow dosing for individual components</i>	<i>\$74</i>
<i>Lotensin HCT<sup>®</sup></i>	<i>Benazepril/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$32-\$62</i>
<i>Lotrel<sup>®</sup></i>	<i>amlodipine/ benazepril</i>	<i>Follow dosing for individual components</i>	<i>\$80-\$146</i>
<i>Micardis HCT<sup>®</sup></i>	<i>Telmisartan/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$145-\$165</i>
<i>Amiloride/ HCTZ</i>	<i>HCTZ/amiloride</i>	<i>1-2 tablets every day with meals (50mg/5mg)</i>	<i>\$35-\$70</i>
<i>Prestalia<sup>®</sup></i>	<i>Perindopril/ amlodipine</i>	<i>3.5/25-14/10 daily</i>	<i>\$204 (brand only)</i>
<i>Tarka<sup>®</sup></i>	<i>trandolapril/ verapamil</i>	<i>Follow dosing for individual components</i>	<i>\$159</i>
<i>Tekturna HCT<sup>®</sup></i>	<i>Aliskiren/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$249-\$314</i>

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			<i>(brand only)</i>
<i>Tenoretic<sup>®</sup></i>	<i>atenolol/ chlorthalidone</i>	<i>Follow dosing for individual components</i>	<i>\$56-\$80</i>
<i>Tribenzor<sup>®</sup></i>	<i>Amlodipine/ olmesartan/ HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$136-\$297</i>
<i>Twynsta<sup>®</sup></i>	<i>Telmisartan/ amlodipine</i>	<i>Follow dosing for individual components</i>	<i>\$156-\$171</i>
<i>Moexipril/ HCTZ</i>	<i>HCTZ/moexipril</i>	<i>Follow dosing for individual components</i>	<i>\$39</i>
<i>Vaseretic<sup>®</sup></i>	<i>HCTZ/enalapril</i>	<i>10/25-20/50 daily</i>	<i>\$32-\$73</i>
<i>Zestoretic<sup>®</sup></i>	<i>HCTZ/lisinopril</i>	<i>Follow dosing for individual components</i>	<i>\$4-\$36</i>
<i>Ziac<sup>®</sup></i>	<i>bisoprolol/HCTZ</i>	<i>Follow dosing for individual components</i>	<i>\$34-\$221</i>

*\* 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 of the 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*

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**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.<sup>4</sup> 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.<sup>5</sup> 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**

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<sup>4</sup> 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.

<sup>5</sup> 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.

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- The USPSTF recommends “obtaining measurements outside of the clinical setting for diagnostic confirmation before starting treatment.”<sup>6</sup> They found that ABPM is the most accurate method for making a diagnosis, but that HBPM may be an acceptable alternative.
- Similarly, the 2017 ACC/AHA HTN guideline states “Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension.”<sup>7</sup>

**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.”<sup>5</sup>

**How to use**

**Choose an appropriate BP monitoring device<sup>8</sup>**

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

**Instruct the patient and make sure the patient is measuring accurately<sup>9</sup>**

**Training** – Patients should receive a brief training by a health care provider about hypertension, choosing an appropriate cuff, and best practice for measurement.

<sup>6</sup> 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 3/2/20.

<sup>7</sup> 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.

<sup>8</sup> 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.

<sup>9</sup> 2017 ACC/AHA HTN Guideline, Table 10, p 30.

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**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."<sup>7</sup>
- Bring your monitor with recorded bps to your doctor's office
- Videos can be viewed at: <https://youtu.be/0tGyRJxbYpQ> or <https://youtu.be/l7XxfmDjyEg>

**Interpretation of results**

As based on an equivalent CV risk, equivalent blood pressures are specified in the 2017 guideline as follows:<sup>10</sup>

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 2020 NQF Hypertension Quality Measure, a validated home blood pressure may be used to count toward the measure. 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

<sup>10</sup> 2017 ACC/AHA HTN Guideline, section 4.2, See Table 11, p 29.

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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.<sup>11</sup>

**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  $\geq 130/80$  but  $< 160/100$  after 3-month trial of lifestyle with suspected white coat effect**

HBPM  $< 130/80$ ? Yes  $\rightarrow$  Confirmation of white coat effect. Continue lifestyle modification and repeat HBPM in 1 year

No  $\rightarrow$  Confirms hypertension, continue lifestyle, start medication

**Office BP 120-129/ $< 80$  after 3-month trial of lifestyle with suspected masked hypertension**

HBPM  $\geq 130/80$ ? Yes  $\rightarrow$  Confirmation of masked hypertension, continue lifestyle, start medication

No  $\rightarrow$  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  $\geq 5-10$  mm above goal on  $\geq 3$  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)

Basis for recommendation

<sup>11</sup> 2017 ACC/AHA HTN Guideline, section 4.4, p 33, also see Table 12.

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This recommendation was based on a literature search and review of the literature conducted by Dr. Weinfeld. You can view the strategy at:

[https://pubmed.ncbi.nlm.nih.gov/?term=\(\(%22blood%20pressure%20monitoring%2C%20ambulatory%22%5BMeSH%20Terms%5D%20OR%20\(\(\(%22blood%22%5BAll%20Fields%5D%20AND%20%22pressure%22%5BAll%20Fields%5D\)%20AND%20%22monitoring%22%5BAll%20Fields%5D\)%20AND%20%22ambulatory%22%5BAll%20Fields%5D\)\)%20OR%20%22ambulatory%20blood%20pressure%20monitoring%22%5BAll%20Fields%5D\)%20OR%20\(\(\(%22home%22%5BAll%20Fields%5D%20AND%20%22blood%22%5BAll%20Fields%5D\)%20AND%20%22pressure%22%5BAll%20Fields%5D\)%20AND%20%22monitoring%22%5BAll%20Fields%5D\)\)%20OR%20%22home%20blood%20pressure%20monitoring%22%5BAll%20Fields%5D&sort=&page=9&pos=5](https://pubmed.ncbi.nlm.nih.gov/?term=((%22blood%20pressure%20monitoring%2C%20ambulatory%22%5BMeSH%20Terms%5D%20OR%20(((%22blood%22%5BAll%20Fields%5D%20AND%20%22pressure%22%5BAll%20Fields%5D)%20AND%20%22monitoring%22%5BAll%20Fields%5D)%20AND%20%22ambulatory%22%5BAll%20Fields%5D))%20OR%20%22ambulatory%20blood%20pressure%20monitoring%22%5BAll%20Fields%5D)%20OR%20(((%22home%22%5BAll%20Fields%5D%20AND%20%22blood%22%5BAll%20Fields%5D)%20AND%20%22pressure%22%5BAll%20Fields%5D)%20AND%20%22monitoring%22%5BAll%20Fields%5D))%20OR%20%22home%20blood%20pressure%20monitoring%22%5BAll%20Fields%5D&sort=&page=9&pos=5)

Review pdfs of key papers at:

[https://drive.google.com/drive/folders/1-suUIG9\\_ykhcLR\\_eWkESfcTPS0yQflzQ?usp=sharing](https://drive.google.com/drive/folders/1-suUIG9_ykhcLR_eWkESfcTPS0yQflzQ?usp=sharing)

<b><u>Initial Approval Date and Reviews:</u></b>	<b><u>Most Recent Revision and Approval Date:</u></b>	<b><u>Next Scheduled Review Date:</u></b>
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 by Ambulatory Quality Best Practice Committee	<b><u>March 2020</u></b> © Copyright MedStar Health, 2020	March 2022 Ambulatory Best Practice