Contact for Changes:
Name: Lindsey Spencer, MS- Center for Clinical Knowledge Management (CCKM)
Phone Number: (608) 890-6403
Email Address: lspencer2@uwhealth.org

Coordinating Team Members:
Heather Johnson, MD, MS- Medicine- Cardiology
Jim Stein, MD- Medicine- Cardiology
Patrick McBride, MD- Medicine- Cardiology
Mukesh Singh, MD- Cardiology (SwedishAmerican)
Michael Thom, MD- Internal Medicine
Nancy Fuller, MD- Internal Medicine
Joel Buchanan, MD- Internal Medicine
Jeff Huebner, MD- Family Medicine/Population Health
Doug Smith, MD- Family Medicine
Pam Olson, MD- Family Medicine
Stephanie Gorham, MD- Family Medicine (SwedishAmerican)
Chris Danford, MD- Family Medicine Resident
Donald Wiebe, MD- Laboratory
Cindy Gaston, PharmD- Drug Policy Program
Sara Shull, PharmD- Drug Policy Program
Kristina Yokes, PharmD- Pharmacy- Ambulatory Clinics
Karen Kopacek, R. Ph- UW-Madison School of Pharmacy
Vonda Shaw- Cardiac Rehabilitation
Tami Schiltz- Clinical Nutrition
Diane Wendland, MD- Family Medicine (Unity Point Health- Meriter)
Heidi Vierstra- Unity Point Health- Meriter
Elaine Rosenblatt, MSN, FNP-BC- Unity Health Insurance
Heidi Wolf- Unity Health Insurance
Carl Nelson, PharmD- Unity Health Insurance
Erica Guetzlaff, PharmD- Group Health Cooperative

Review Individuals/Bodies:
Micah Chan, MD, MPH, FACP, FNKF, FASDIN- Medicine- Nephrology
Maryl Johnson, MD- Medicine- Cardiology
Vanessa Rein, MD- Medicine- Endocrinology
David Feldstein, MD- Internal Medicine
Jennifer Passini, MD- Medicine- Hospitalists
Elizabeth Chapman, MD- Medicine- Geriatrics
Holly Hanson, NP- Medicine- Hospitalists

Committee Approvals/Dates:
Clinical Knowledge Management (CKM) Council (Last Periodic Review: 04/28/16)

Release Date: May 2016  |  Next Review Date: April 2018
Executive Summary
Guideline Overview
A UW Health multi-disciplinary group has developed this clinical practice guideline to assist in identifying, diagnosing, treating, and monitoring adults 18 years and older with hypertension. In preparation for the clinical practice update, the guideline workgroup reviewed the 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults Report, a report from the panel members appointed to the Eighth Joint National Committee (JNC 8). Additional trials and hypertension data not incorporated by the JNC 8 panel were also reviewed.

After comprehensive evaluation of the above mentioned sources, the guideline workgroup expressed criticism for the methodology under which JNC 8 was developed and its inconsistency with previous reports. The guideline workgroup agreed that this guideline would be based primarily on the 2013 Clinical Practice Guidelines for the Management of Hypertension in the Community: A Statement by the American Society of Hypertension and the International Society of Hypertension. This document currently reflects the clinical practice consensus of this committee and is supplemented by other individual articles or sources.

Key Revisions (2016 Focused Periodic Review)
1. Endorsed U.S. Preventive Services Task Force (USPSTF) blood pressure screening recommendations, with modifications to best fit UW Health.
2. Revised blood pressure treatment goals based on recent publications (e.g., SPRINT).
3. Removed recommendations for BUN, fasting glucose, and annual lipid testing.
4. Removed recommendation for Mediterranean diet as primary dietary intervention for patients with hypertension.

Key Practice Recommendations
1. This guideline and the USPSTF recommend obtaining blood pressure measurements outside of the clinical setting to confirm a new diagnosis of hypertension before starting treatment. Additional out-of-clinic readings are also recommended in patients suspected of having “white coat” or “masked” hypertension.
2. Patients with a new diagnosis of hypertension should have an evaluation for possible secondary causes of hypertension, especially obstructive sleep apnea.
3. Lifestyle modifications are the cornerstone of treatment for every patient (See Table 5 - Lifestyle Modifications). Educate all patients to limit their sodium intake to 1,500 to 2,400 mg/day.
4. An ACE-inhibitor (or angiotensin receptor blocker) and/or a long-acting dihydropyridine calcium channel blocker may be a more effective initial medication regimen than a thiazide or thiazide-type diuretic.
5. Chlorthalidone (12.5 to 25 mg daily) is the recommended thiazide-type diuretic, rather than hydrochlorothiazide (HCTZ).

Companion Documents
1. 2016 Diabetes Guideline: Key Practice Recommendations
2. Referral Criteria for Workplace HTN Screening
3. Standard Rooming Criteria – Pediatric/Adult – Ambulatory Guideline
4. Preventive Health Care – Pediatric/Adult – Ambulatory Guideline
5. Alcohol Assessment and Intervention – Pediatric/Adult – Ambulatory Guideline
6. Standards of Medical Care in Diabetes – Pediatric/Adult – Inpatient/Ambulatory Guideline
7. Tobacco Cessation – Pediatric/Adult – Inpatient/Ambulatory Guideline
8. Secondary Prevention of Atherosclerotic Cardiovascular Disease – Adult – Inpatient/Ambulatory Guideline
Scope
Disease/Condition(s): Hypertension

Clinical Specialty: Internal Medicine, Family Medicine, Obstetrics/Gynecology, Cardiovascular Medicine, Nephrology, Neurology, Pharmacy, Laboratory

Intended Users: Physicians, Advanced Practice Providers, Nurses, RN Care Coordinators, Pharmacists

Objective(s): To provide recommendations that reduce the incidence of stroke, myocardial infarction, congestive heart failure, and kidney failure by identifying and treating hypertension.

Target Population: Adults age 18 years or older

Interventions and Practices Considered:
- Lifestyle modifications (e.g., weight management, physical activity, diet modifications)
- Pharmacological treatment

Major Outcomes Considered:
- Blood pressure reduction at or below goal

Methodology
Methods Used to Collect/Select the Evidence:
Electronic database searches (e.g., PUBMED) were conducted by the guideline author(s) and workgroup members to collect evidence for review. Expert opinion and clinical experience were also considered during discussions of the evidence.

Methods Used to Formulate the Recommendations:
The workgroup members agreed to adopt recommendations developed by external organizations and/or arrived at a consensus through discussion of the literature and expert experience. All recommendations endorsed or developed by the guideline workgroup were reviewed and approved by other stakeholders or committees (as appropriate).

Methods Used to Assess the Quality of the Evidence/Strength of the Recommendations:
Recommendations developed by external organizations maintained the evidence grade assigned within the original source document and were adopted for use at UW Health.

Internally developed recommendations, or those adopted from external sources without an assigned evidence grade, were evaluated by the guideline workgroup using an algorithm adapted from the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology (see Figure 1 in Appendix A).

Rating Scheme for the Strength of the Evidence/Recommendations:
See Appendix A for the rating scheme(s) used within this document.
Introduction

Hypertension is the most common condition seen in primary care and leads to myocardial infarction, stroke, renal failure, and death if not detected early and treated appropriately. Patients want to be assured that blood pressure (BP) treatment will reduce their disease burden; clinicians want guidance on hypertension management using the best scientific evidence. This guideline takes a rigorous, evidence-based approach to recommend treatment thresholds, goals, and use of medications in the management of hypertension in adults. Evidence was drawn from randomized controlled trials and national guidelines for determining efficacy and effectiveness.

Recommendations

BLOOD PRESSURE SCREENING

Factors which increase risk for high blood pressure include:2-5

- High-normal blood pressure/pre-hypertension (130-139/85-89 mmHg)
- Overweight or obesity (BMI ≥ 25 kg/m² or ≥ 23 kg/m² in Asian Americans)
- Diabetes mellitus or impaired fasting glucose
- Tobacco use
- African American ancestry
- Family history of hypertension
- Secondary causes of hypertension (see Table 2)

The U.S. Preventive Services Task Force (USPSTF) recommends screening for high blood pressure in adults aged 18 years or older.6 (USPSTF Grade A) Annual blood pressure screening is recommended for adults aged ≥ 40 years old and for all adults with an increased risk for high blood pressure (see risk factors above).5 (UW Health Moderate quality evidence, strong recommendation) Patients aged 18-39 years with normal blood pressure (< 130/85 mmHg), and no other cardiovascular disease risk factors, should be rescreened every 3-5 years.5 (USPSTF Grade A) Blood pressure measurements should be obtained using proper technique with manual and/or validated automated devices.5,6

ESTABLISHING THE DIAGNOSIS

Patient Evaluation

Assess lifestyle and identify other cardiovascular disease (CVD) risk factors using personal history, physical examination and selective testing.1,2 Evaluate for the presence of target organ damage, CVD risk factors (Table 1), and potential secondary causes of hypertension (Table 2).1

Table 1 – Cardiovascular Disease Risk Factors and Target Organ Damage1,4

<table>
<thead>
<tr>
<th>CARDIOVASCULAR DISEASE RISK FACTORS</th>
<th>TARGET ORGAN DAMAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco use</td>
<td>Heart disease (left ventricular hypertrophy, angina, prior MI, prior CABG, heart failure)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>Chronic kidney disease (CKD)</td>
</tr>
<tr>
<td>Overweight (BMI &gt;25 kg/m² or ≥ 23 kg/m² in Asian Americans)</td>
<td>CVA or TIA</td>
</tr>
<tr>
<td>Diabetes mellitus*</td>
<td>Peripheral arterial disease</td>
</tr>
<tr>
<td>Age (&gt; 45 years for men; &gt; 55 years for women)</td>
<td>Retinopathy</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td></td>
</tr>
<tr>
<td>Family history of early vascular disease or hypertension (women &lt; 65 years; men &lt; 55 years)</td>
<td></td>
</tr>
</tbody>
</table>

BMI- body mass index; MI- myocardial infarction; CABG- coronary artery bypass graft; CVA- cerebrovascular accident ; TIA- transient ischemic attack

*Fasting glucose, oral glucose tolerance test (OGTT), or HgbA1C are appropriate tests to screen for diabetes mellitus.3
Table 2 – Secondary Causes of Hypertension\(^{1,2}\)

<table>
<thead>
<tr>
<th>Secondary Causes of Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Obstructive sleep apnea (OSA)</td>
</tr>
<tr>
<td>• CKD</td>
</tr>
<tr>
<td>• Thyroid or parathyroid disease</td>
</tr>
<tr>
<td>• Medications (stimulants, estrogen, corticosteroids, erythropoietin alfa, mineralocorticosteroids, cyclosporine, tacrolimus, NSAIDS, herbs, OTC cold medication, bupropion, triptans, SNRIs)</td>
</tr>
</tbody>
</table>

\(^{1,2}\) NSAID- Non-steroidal antiinflammatory drug; OTC- over the counter; SNRI- serotonin- norepinephrine reuptake inhibitor

Blood Pressure Measurement and Diagnosis of Hypertension

1. Blood pressure measurements obtained using proper technique with manual and/or validated automated devices are acceptable, however automated devices are preferable.\(^6\) (UW Health Moderate quality evidence, weak/conditional recommendation)

2. It is important to consider all blood pressure measurements in the clinical context of the patient to avoid over- or under-diagnosis of hypertension (e.g., elevated measurement expected during acute injury such as a broken wrist or low blood pressure in the setting of dehydration).

3. The diagnosis of hypertension should be based on the presence of two or more elevated blood pressures readings (≥ 140/90 mmHg in a clinic setting), because multiple measurements over time have better positive predictive value for the diagnosis of hypertension than a single measurement.\(^2,5\) The USPSTF recommends obtaining blood pressure measurements outside of the clinical setting to confirm a new diagnosis of hypertension before starting treatment.\(^5\) (USPSTF Grade A) Measurements outside the clinic, although optimal, may not always be possible due to patient barriers (including compliance). (UW Health Moderate quality evidence, weak/conditional recommendation) Additional out-of-clinic readings are also recommended in patients suspected of having “white coat” or “masked” hypertension.\(^1,7,9\) (UW Health Moderate quality evidence, strong recommendation)

Out-of-clinic blood pressure readings may be obtained via ambulatory blood pressure monitoring (ABPM) or extended home blood pressure monitoring (HBPM).\(^5,8,9\) (USPSTF Grade A) The USPSTF found convincing evidence that ABPM is the best method for diagnosing hypertension, and considers it to be the reference standard for confirming the diagnosis.\(^5\) 24-hour ABPM is offered by the UW Preventive Cardiology Clinic (608-263-7420). Alternatively, good quality evidence suggests that confirmation of hypertension with HBPM may be acceptable.\(^5\)

During extended HBPM, patients should initially monitor their home blood pressure 1-2 times per day at various times of the day, at least 5 times per week, over a 1-2 week period.\(^9\) (UW Health Low quality evidence, weak/conditional recommendation) Patients should be encouraged to bring their home blood pressure readings to their follow-up visit.

All patients should be advised to use a home blood pressure cuff. The home blood pressure monitor should be automated, digital and have an upper arm cuff (not wrist or fingertip).\(^6\) (UW Health Moderate quality evidence, strong recommendation) Mobile health technologies including smartphone apps should not be used.\(^10\) (UW Health Low quality evidence, strong recommendation) (See Appendix B for equipment information)
TREATMENT AND MANAGEMENT

Physicians are strongly encouraged to discuss the benefits and risks of treatment with their patients. As the relationship between blood pressure and risk of CVD events is continuous and independent of other risk factors, the benefits of blood pressure treatment are highest at higher levels and diminish at lower blood pressures.\(^{1,11,12}\)

Potential harms of hypertension treatment depend on the specific antihypertensive agent and other patient-related factors (e.g., age, polypharmacy, left ventricular function, kidney function, and co-morbidities) but may include hypotension, syncope, electrolyte abnormalities, and acute kidney injury or acute renal failure.\(^{11,13}\) In the Systolic Blood Pressure Intervention Trial (SPRINT), approximately 4.7% of patients assigned to the intensive treatment goal (systolic blood pressure < 120 mmHg) compared to 2.5% of those with a standard goal (systolic blood pressure < 140 mmHg) had serious adverse events that were possibly or definitely related to the intervention. Syncope and hypotension (outside of the clinic) were more common in the intensive-treatment group than in the standard treatment group; however the absolute difference between groups was < 1% and there were no between-group differences for injurious falls. Rates of acute kidney injury or acute renal failure were 1.8% higher (absolute difference) with intensive treatment.\(^{13}\)

Blood Pressure Classifications

Blood pressure is strongly related to CVD morbidity and mortality. Compared to patients with normal blood pressure, there is a doubling of CVD risk in patients with pre-hypertension.\(^{1}\) Systolic hypertension is more predictive of events than diastolic blood pressure, especially in patients over 40 years old.\(^{1}\)

Table 3 outlines the blood pressure classifications at diagnosis.\(^{6}\) Classification is based on the mean of two or more properly measured seated blood pressure readings on each of two or more office visits, optimally confirmed with patient measurements as described above.

<table>
<thead>
<tr>
<th>OFFICE BLOOD PRESSURE</th>
<th>SYSTOLIC/DIASTOLIC (mmHg)</th>
<th>LIFESTYLE MODIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120 / &lt; 80</td>
<td>Encourage</td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>120-139 / 80-89</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 1</td>
<td>140-159 / 90-99</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 2</td>
<td>≥ 160 / ≥ 100</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Treatment Goals

To prevent the complications of hypertension, set clear treatment goals based on the individual patient’s risk and values and preferences established through a shared-decision making conversation; the systolic and diastolic blood pressure should be at goal:

1. For uncomplicated hypertension, including patients with chronic kidney disease (CKD) without proteinuria, the goal is an office blood pressure <140/90 mmHg (home blood pressure < 135/85 mmHg).\(^1,2,14\) (UW Health Moderate quality evidence, strong recommendation)

2. Patients with diabetes mellitus should be treated to a goal of < 140/90 mmHg.\(^3\) (ADA Grade A) Lower targets, such as < 130/80 mmHg, may be appropriate for certain individuals such as younger patients, those with albuminuria, and/or those with hypertension and one or more additional atherosclerotic CVD risk factors, if they can be achieved without undue treatment burden.\(^3\) (ADA Grade C) Younger patients are defined as < 40 years of age. (UW Health Very low quality evidence, weak/conditional recommendation)

3. A lower office systolic blood pressure target of < 130 mmHg may also be considered in individuals with left ventricular systolic dysfunction (LVEF ≤ 40%), congestive heart failure (with preserved or reduced ejection fraction), and CKD with proteinuria defined as urine protein/creatinine ratio ≥ 1 (≥ 1 gram protein/24 hours) or urine protein/Cr ratio ≥ 0.22 if African-American (≥ 300mg/24 hours).\(^11,12,14-18\) (UW Health Moderate quality evidence, weak/conditional recommendation)

4. For patients > 50 years old with a systolic blood pressure > 130-180 mmHg and a history of CVD or with increased CVD risk* a target systolic blood pressure closer towards 120 mmHg is indicated, unless they have one of the following\(^11-13\) (UW Health High quality evidence, weak/conditional recommendation):
   - high antihypertensive medication burden** or intolerance to current regimen
   - 1 minute standing SBP <110 mmHg
   - history of CVA
   - diabetes mellitus (see recommendation above for patients with diabetes mellitus)
   - organ transplant
   - pregnancy
   - < 3 years expected survival
   - reside in a skilled nursing facility
   - difficulty with medication adherence including alcohol abuse, psychiatric disease, history of non-compliance.

*Increased CVD risk is defined as one of the following: peripheral artery disease, abdominal aortic aneurysm (AAA) ≥ 5 cm with or without repair, 10-year Framingham Risk Score ≥ 15%, age ≥ 75 years, left ventricular hypertrophy, ankle-brachial index ≤ 0.9, increased coronary artery calcification (score ≥ 400 Agatston units), abnormal stress test (with or without imaging), 50% or greater coronary or carotid artery stenosis, CKD without proteinuria (eGFR 20-59 ml/min/1.73 m\(^2\))

**Excessive number of baseline antihypertensive medications is defined as ≥ 4 medications and SBP <150 mmHg OR ≥ 2 medications and SBP is 150-180 mmHg. These patients are less likely to benefit from an intensive target (SBP ~120 mmHg) due to the large burden of medications likely needed to achieve goal.
Table 4 – Blood Pressure Treatment Goals

<table>
<thead>
<tr>
<th>BLOOD PRESSURE GOALS</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOME</td>
<td>&lt; 135/85 mmHg</td>
</tr>
<tr>
<td>OFFICE</td>
<td>&lt; 140/90 mmHg</td>
</tr>
</tbody>
</table>

**Additional Considerations**

- A lower office systolic goal of < 130 mmHg may be considered in patients with LVEF ≤ 40%, congestive heart failure, diabetes mellitus (< 40 years of age, albuminuria, and/or those with one or more additional atherosclerotic CVD risk factor), and CKD with proteinuria (urine protein/Cr ratio > 1 or ≥ 0.22 in African-Americans)
- Work towards a systolic goal of 120 mmHg in patients > 50 years old with SBP > 130-180 mmHg and history of CVD or with increased CVD risk* unless contraindicated**

*Increased CVD risk (one of the following): peripheral artery disease, AAA > 5 cm, 10-year Framingham Risk Score ≥15%, age ≥75 years, left ventricular hypertrophy, ankle-brachial index ≤ 0.9, increased coronary artery calcification (score > 400 Agatston units), abnormal stress test (with or without imaging), 50% or greater coronary or carotid artery stenosis, CKD without proteinuria (eGFR 20-59 ml/min/1.73 m²)

**Contraindications: High antihypertensive medication burden or intolerance to current regimen; one minute standing SBP <110 mmHg; history of stroke; diabetes mellitus; organ transplant; pregnancy; < 3 years expected survival; residing in a skilled nursing facility; difficulty with medication adherence including alcohol abuse, psychiatric disease, history of non-compliance.

**Monitoring and Laboratory Testing**

1. Following diagnosis, blood pressure should be measured at each health care encounter. *(UW Health Low quality evidence, strong recommendation)* Blood pressure control should be assessed periodically at a clinic visit with a RN, APP or MD, however active telephone recall has also demonstrated benefit in patients with low appointment adherence.¹¹,¹⁹ *(UW Health Low quality evidence, strong recommendation)*

Patients who are not at goal (and not undergoing medication adjustments) should be seen in the clinic for assessment by a RN, APP, or MD at least every 3 months, whereas patients at goal may be seen annually. *(UW Health Very low quality evidence, weak/conditional recommendation)* All patients may be seen more frequently if deemed necessary per the results of prior clinical assessments or need for medication adjustments.

2. Treatment decisions, including medication adjustments, should be based on office blood pressure measurements that are considered within the full clinical context of each individual patient. Ongoing home blood pressure monitoring (in addition to clinic measurements) is recommended, as needed, to provide additional information for assessing treatment response or for changes in clinical status.²² *(UW Health Moderate quality evidence, strong recommendation)* The home blood pressure goal is ≤ 135/85 mmHg.⁶ *(UW Health Moderate quality evidence, strong recommendation)*

Patients should be encouraged to bring their home blood pressure cuff to clinic as an educational opportunity (e.g., to avoid improper use, evaluate appropriate size, etc.) and to consider comparing office and home monitoring equipment (e.g., large discrepancies in measurement). *(UW Health Very low quality evidence, weak/conditional recommendation)*

3. Check creatinine and potassium levels 1-2 weeks after medication initiation, at each dose change, and every 12 months thereafter in patients on diuretics, ACE-Is, ARBs, or
spironolactone.¹⁻³,²¹ (UW Health Low quality evidence, strong recommendation) More frequent monitoring may be needed if symptoms suggest renal or electrolyte disorders.

4. Check serum sodium after diuretic (including spironolactone) initiation, at each dose change, and as needed to evaluate for hyponatremia. (UW Health Low quality evidence, strong recommendation)

5. Additional laboratory monitoring (e.g., BUN, fasting lipid panel, fasting glucose) can be considered for individual patients, but are no longer recommended based on a diagnosis of hypertension alone.

Treatment Modalities- Lifestyle Modifications and Pharmacotherapy

Lifestyle Modifications

1. All patients should be encouraged to make lifestyle modifications, as these are the cornerstone of treatment (Table 5).²,²² (UW Health High quality evidence, strong recommendation) Lifestyle modifications can be as effective as pharmacological monotherapy and may mitigate the need for drug or multi-drug treatment. They may also reduce the number and dose of antihypertensive medications and can be as or more effective than drug monotherapy. Lifestyle changes should be reinforced at every patient encounter, even after medication initiation.

2. In patients with Stage 1 hypertension, without other CVD risk factors or target organ damage, six months of monitored lifestyle modifications may be considered prior to initiating an antihypertensive medication.² (UW Health Moderate quality evidence, weak/conditional recommendation)

3. Providers should consider referrals to registered dieticians and exercise experts to help patients initiate lifestyle changes. (UW Health Very low quality evidence, weak/conditional recommendation) Of the choices for dietary interventions, the DASH-Sodium diet is most effective at lowering blood pressure.²² (UW Health High quality evidence, strong recommendation)

Table 5 – Lifestyle Modifications

<table>
<thead>
<tr>
<th>LIFESTYLE ELEMENT (Range of Approximate SBP Pressure Reduction)</th>
<th>RECOMMENDATIONS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (5-20 mmHg/10kg weight loss)</td>
<td>Weight loss in patients who are overweight or obese.</td>
<td>Weight loss can lower BP, increase the efficacy of antihypertensive medications, and improve CVD risk factors such as diabetes mellitus and dyslipidemia. As little as a 10 pound loss may improve BP. For every one pound of weight loss, BP may decrease by 1-2 mmHg.</td>
</tr>
<tr>
<td>Alcohol (2-4 mmHg)</td>
<td>Reduce or eliminate alcohol.</td>
<td>Alcohol is a risk factor for hypertension, contributes excess calories, can reduce efficacy of antihypertensive medications, and increases the risk of stroke. Men should have no more than 2, and women no more than 1, alcoholic drink(s) daily. Examples of one drink are 12 oz. of beer, 4 oz. of wine, or 1 oz. of spirits.</td>
</tr>
<tr>
<td>LIFESTYLE ELEMENT (Range of Approximate SBP Pressure Reduction)</td>
<td>RECOMMENDATIONS</td>
<td>COMMENTS</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Physical Activity (4-9 mmHg)</td>
<td>30-45 minutes of moderately intense physical activity most days of the week with a minimum of 150 minutes per week.</td>
<td>Exercise contributes to weight loss and reduces the risks of CVD and overall mortality. Patients at high risk should have an exercise stress test prior to starting a new program. Medically supervised exercise programs should be advised if BP response to exercise is a concern (call UW Preventive Cardiology Program 263-7420 for information about monitored exercise sessions). Patient handout: Lowering Blood Pressure with Lifestyle Change <a href="https://content.healthdecision.org/handouts/lower-bp">https://content.healthdecision.org/handouts/lower-bp</a></td>
</tr>
<tr>
<td>DASH (DASH-Sodium) diet (2-8 mmHg)</td>
<td>Limit to 1500-2400 mg/day.</td>
<td>African-Americans, patients &gt; 65 years old, and patients with diabetes mellitus are especially sensitive to changes in sodium intake. Processed foods (canned soups and vegetables, frozen and boxed dinners, chips, luncheon meats, etc.) and foods eaten out are responsible for 50-75% of the sodium in the American diet. Patient handout: Making Exercise Part of Your Life <a href="https://content.healthdecision.org/handouts/exercise-life">https://content.healthdecision.org/handouts/exercise-life</a></td>
</tr>
<tr>
<td>Potassium, Magnesium, and Calcium</td>
<td>Recommendations for good health: Potassium – 4700 mg/day</td>
<td>Diets high in potassium are especially effective for reducing blood pressure in African-Americans.</td>
</tr>
<tr>
<td>Tobacco and second-hand smoke</td>
<td>Smoking cessation and avoidance of second-hand smoke.</td>
<td>Tobacco and its by-products increase CVD risk and may make antihypertensive medications less effective. Each cigarette causes an increase in blood pressure. The CVD benefits of smoking cessation are evident in one year.</td>
</tr>
</tbody>
</table>
Pharmacotherapy

1. The choice of medication should be influenced by patient age, ethnicity/race, and other clinical characteristics such as comorbidities or pregnancy status (Figure 1, Table 6 and Table 7). (UW Health Moderate quality evidence, weak/conditional recommendation)

2. Most patients with hypertension require 2-3 drugs to get to their target blood pressure goal. Consider starting two medications for patients with blood pressure measurements > 20/10 mmHg above goal. (UW Health Moderate quality evidence, weak/conditional recommendation)

Patients on pharmacotherapy should be monitored for possible side effects of medication to help assure patient compliance (see Monitoring and Laboratory Testing section).

Figure 1 - Initiation and Titration of Antihypertensive Medication

Office blood pressure ≥ 140/90 mmHg in adults aged 18 years or older (Recommended to confirm diagnosis with readings outside of the clinic)

Start Lifestyle Modifications (e.g., weight loss, physical activity, DASH-sodium diet, smoking cessation)

Stage 1 Drug Therapy
(140-159/90-99 mmHg)
(Consider a delay in uncomplicated Stage 1 patients*)

Black Patients

CCB or Thiazide
If needed, add...

ACE-I or ARB
OR combine CCB + Thiazide
If needed...

Non-Black Patients

Age < 60 years?
Yes
ACE-I or ARB
If needed, add...

CCB or Thiazide
If needed...

No

Stage 2 Drug Therapy
(≥ 160/100 mmHg)

All Patients

Start with 2 drugs
CCB or Thiazide + ACE-I or ARB

Special Cases
• Kidney disease
• Diabetes
• Coronary disease
• Stroke history
• Heart failure
See Tables 6 and 7

If needed...

If needed, add...

Add other drugs (e.g., spironolactone; centrally acting agents; β-blockers)

If needed...

Refer to Hypertension Specialist

*Six months of monitored lifestyle modifications may be considered in patients with Stage 1 hypertension, without other cardiovascular risk factors or target organ damage, prior to initiating antihypertensive medications. | CCB: calcium channel blocker; ACE-I: angiotensin-converting enzyme inhibitors; ARB: angiotensin receptor blocker

Figure adapted from the 2014 American Society of Hypertension and the International Society of Hypertension Guideline.
## Table 6 - Treatment of Hypertension With and Without Compelling Indications

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>First Drug</th>
<th>Add Second Drug if Needed to Achieve a BP &lt; 140/90 mmHg</th>
<th>If Third Drug is Needed to Achieve a BP &lt; 140/90 mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. When hypertension is the only or main condition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black patients (African ancestry): All ages</td>
<td>CCB(^a) or thiazide diuretic</td>
<td>ARB(^b) or ACE inhibitor (If unavailable can add alternative first drug choice)</td>
<td>Combination of CCB + ACE inhibitor or ARB + thiazide diuretic</td>
</tr>
<tr>
<td>White and other non-black patients: &lt; 60 years</td>
<td>ARB(^b) or ACE inhibitor</td>
<td>CCB(^a) or thiazide diuretic</td>
<td>Combination of CCB + ACE inhibitor or ARB + thiazide diuretic</td>
</tr>
<tr>
<td>White and other non-black patients: &gt; 60 years</td>
<td>CCB(^a) or thiazide diuretic (Although ACE inhibitors or ARBs are also usually effective)</td>
<td>ARB(^b) or ACE inhibitor (for CCB or thiazide if ACE inhibitor or ARB used first)</td>
<td>Combination of CCB + ACE inhibitor or ARB + thiazide diuretic</td>
</tr>
<tr>
<td><strong>B. When hypertension is associated with other conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension and diabetes mellitus</td>
<td>ARB or ACE inhibitor Note: In black patients, it is acceptable to start with a CCB or thiazide</td>
<td>CCB or thiazide diuretic Note: In black patients, if starting with a CCB or thiazide, add an ARB or ACE inhibitor</td>
<td>The alternative second drug (thiazide or CCB)</td>
</tr>
<tr>
<td>Hypertension and chronic kidney disease</td>
<td>ARB or ACE inhibitor Note: In black patients, good evidence for renal protective effects of ACE inhibitors</td>
<td>CCB or thiazide diuretic(^c)</td>
<td>The alternative second drug (thiazide or CCB)</td>
</tr>
<tr>
<td>Hypertension and clinical coronary artery disease(^d)</td>
<td>B-blocker plus ARB or ACE inhibitor</td>
<td>CCB or thiazide</td>
<td>The alternative second drug (thiazide or CCB)</td>
</tr>
<tr>
<td>Hypertension and stroke history(^e)</td>
<td>ACE inhibitor or ARB</td>
<td>Thiazide diuretic or CCB</td>
<td>The alternative second drug (CCB or thiazide)</td>
</tr>
<tr>
<td>Hypertension and heart failure</td>
<td>Patients with symptomatic heart failure should usually receive an ARB or ACE inhibitor + B-blocker + diuretic + spironolactone regardless of blood pressure. A dihydropyridine CCB can be added if needed for BP control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; BP = blood pressure; CCB = calcium channel blocker; eGFR = estimated glomerular filtration rate

\(^a\) CCBs are generally preferred, but thiazides may cost less.
\(^b\) ARBs can be considered because ACE inhibitors can cause cough and angioedema, although ACE inhibitors may cost less.
\(^c\) If eGFR < 40 mL/min, a loop diuretic (e.g., furosemide or torsemide) may be needed.
\(^d\) Note: If history of myocardial infarction, a β-blocker and ARB/or ACE inhibitor are indicated regardless of blood pressure.
\(^e\) Note: If using a diuretic, there is good evidence for indapamide (if available).
HEART FAILURE

- ACE-I (or ARB) is indicated in nearly all patients with LV systolic dysfunction.
- ACE-I (or ARB) should be titrated to target heart failure doses, even if blood pressure is low, as long as the patient does not become symptomatic or develop impaired renal perfusion.
- Beta Blockers (carvedilol and metoprolol succinate) in nearly all patients with LV systolic dysfunction. Titrate to target heart failure doses.
- Consider spironolactone after the patient is placed on the maximum doses of ACE-I and beta-blocker, especially if Class III or IV heart failure or LV ejection fraction is < 40%.
- Diuretics (usually loop) are often required for fluid management.

CHRONIC KIDNEY DISEASE (CKD)

<table>
<thead>
<tr>
<th>Stages of CKD</th>
<th>GFR (mL/min/1.73m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Kidney damage with normal GFR ≥90</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Kidney damage with mild ↓ GFR 60-89</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Moderate ↓ GFR 30-59</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Severe ↓ GFR 15-29</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Kidney failure &lt;15 (or dialysis)</td>
</tr>
</tbody>
</table>

CKD is defined as either kidney damage or GFR <60 mL/min/1.73 m² for 3 months. Kidney damage is defined as pathologic abnormalities or markers for damage, including abnormalities in blood or urine tests or imaging studies.

- ACE-I and ARB’s can slow progression of kidney disease.
- A limited increase in serum creatinine of as much as 30% above baseline with ACE-I or ARB is acceptable and not a reason to withhold treatment, unless hyperkalemia develops.
- In CKD stages 4 and 5 (estimated glomerular filtration rate <30 mL/min/per 1.73 m²) higher doses of loop diuretics may be needed in combination with other drug classes.

Diuretics

1. Typically thiazide-type diuretics are used instead of loop diuretics unless the patient has fluid retention that does not respond (such as patients with LV systolic dysfunction or advanced kidney disease).
2. Diuretics should be considered part of all triple medication regimens, though do not need to be the first or second line medications, as previously recommended. They are especially useful in patients with edema, who are overweight, or in the elderly.
3. Chlorthalidone (12.5-25 mg daily) is the recommended thiazide-type diuretic rather than hydrochlorothiazide (HCTZ). It is longer acting and a more potent antihypertensive; however more careful monitoring for electrolyte and renal disturbances is needed.
4. Diuretics are synergistic with other classes of antihypertensive medications.
5. Low doses of thiazide-type diuretics should be used unless the patient has heart failure or chronic kidney disease and GFR <30-40 mg/min, then use a loop diuretic (furosemide).
6. A diuretic must be added prior to diagnosing a patient with “resistant hypertension”. Resistant hypertension is uncontrolled blood pressure on ≥3 drugs, of which one is a diuretic, or controlled on 4 drugs including a diuretic. Secondary causes should be strongly considered in these patients, with the most likely being OSA, hyperaldosteronism, or chronic kidney disease.
7. High dose diuretics can worsen insulin resistance and dyslipidemia in susceptible individuals, such as those with diabetes mellitus or the metabolic syndrome.

ACE-I AND ARB

1. Use long-acting agents for once per day dosing. Losartan is the weakest ARB and is best dosed twice daily.
2. Angiotensin antagonists can be effective as first-line antihypertensive agents (or in combination with diuretics) especially if the potassium level is low or low-normal.
3. ARB’s are alternatives for patients with ACE-I associated cough or angioedema.
4. In patients with chronic kidney disease, use ACE-I or ARB.
5. After initiating an ACE-I or ARB, an acceptable rise in serum creatinine is up to 30% without stopping the medication. Repeat the creatinine in 2-4 weeks to confirm that it has stabilized or decreased.

6. Contraindicated in pregnant patients. Women of child-bearing potential should be counseled about risks of pregnancy.

7. Avoid combining ACE-Is with ARBs; this combination can increase a patient's risk for adverse renal events.

**CALCIUM CHANNEL BLOCKERS**

1. Amlodipine, long-acting nifedipine, and felodipine are very effective at lowering blood pressure. Diltiazem and verapamil can effectively lower blood pressure at high doses, but may cause bradycardia and constipation. Calcium channel blockers may cause lower extremity edema.

2. Do not use short-acting nifedipine.

**ALDOSTERONE ANTAGONISTS**

1. Low dose spironolactone (12.5-25 mg daily) can be very effective as a 3rd or 4th line agent, especially in overweight patients and patients with hypokalemia. Lab monitoring is required after starting spironolactone to evaluate for hyperkalemia.

**BETA-BLOCKERS**

1. No longer recommended as a first-, second- or third-line antihypertensive agents unless there is a compelling indication (e.g., coronary artery disease, LV systolic dysfunction, atrial fibrillation rate control, etc.).

2. Combined alpha-beta-blockers (i.e., carvedilol, labetalol) are much more effective and less likely to cause metabolic disturbances than high dose pure beta-blockers (like atenolol and metoprolol).

3. Can worsen insulin resistance and dyslipidemia in susceptible individuals, such as those with diabetes mellitus or the metabolic syndrome.

4. Beta-blockers should be used cautiously in patients with type I diabetes mellitus because of the potential to mask hypoglycemia.
<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose (mg)</th>
<th>Minimum Interval Between Dose Adjustments</th>
<th>Usual Dose (mg)</th>
<th>Max Dose (mg)</th>
<th>Doses per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angiotensin-converting enzyme inhibitors (ACE-I)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benazepril</td>
<td>5-10</td>
<td>Increase every 1-2 weeks</td>
<td>10-40</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5-5</td>
<td></td>
<td>5-10</td>
<td>40</td>
<td>1-2</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>5-10</td>
<td></td>
<td>10-40</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Captopril</td>
<td>12.5-25</td>
<td>Increase every 1-2 weeks</td>
<td>25-50</td>
<td>50</td>
<td>2-3</td>
</tr>
<tr>
<td>Quinapril</td>
<td>5-20</td>
<td></td>
<td>10-80</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>10</td>
<td></td>
<td>10-40</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Perindopril</td>
<td>2.4</td>
<td></td>
<td>4-8</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Trandolapril</td>
<td>1-2</td>
<td></td>
<td>2-4</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Ramipril</td>
<td>2.5</td>
<td></td>
<td>5-10</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td><strong>Angiotensin II receptor blockers (ARB)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losartan</td>
<td>25-50</td>
<td>Increase every 1-4 weeks</td>
<td>50-100</td>
<td>100</td>
<td>2</td>
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<tr>
<td>Valsartan</td>
<td>80-160</td>
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<td>80-320</td>
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<tr>
<td>Candesartan</td>
<td>8</td>
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<td>8-32</td>
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<tr>
<td>Irbesartan</td>
<td>75-150</td>
<td></td>
<td>150-300</td>
<td>300</td>
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<tr>
<td>Olmesartan</td>
<td>10-20</td>
<td></td>
<td>20-40</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Telmisartan</td>
<td>20-40</td>
<td></td>
<td>40-80</td>
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<tr>
<td>Azilsartan medoxomil</td>
<td>40</td>
<td></td>
<td>80</td>
<td>80</td>
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</tr>
<tr>
<td><strong>Calcium channel blockers (CCB) – Dihydropyridine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amlodipine</td>
<td>2.5-5</td>
<td>Increase in 2.5 mg increments every 1-2 weeks</td>
<td>5-10</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Nifedipine ER</td>
<td>30-60</td>
<td>Increase every 1-2 weeks</td>
<td>30-90</td>
<td>120</td>
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<tr>
<td>Felodipine</td>
<td>2.5-5</td>
<td>Increase in 5 mg increments every 1-2 weeks</td>
<td>5-10</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td><strong>Calcium channel blockers (CCB) – Non-dihydropyridine</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Diltiazem ER</td>
<td>120-180</td>
<td>Increase every 2 weeks</td>
<td>120-360</td>
<td>360</td>
<td>1</td>
</tr>
<tr>
<td>Verapamil</td>
<td>IR: 120-240</td>
<td>Increase every 1-2 weeks</td>
<td>IR: 80-320</td>
<td>IR: 320</td>
<td>IR: 1</td>
</tr>
<tr>
<td></td>
<td>ER: 180hctz</td>
<td></td>
<td>ER: 120-360</td>
<td>ER: 360</td>
<td>ER: 1</td>
</tr>
<tr>
<td><strong>Thiazide diuretics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorothalidone</td>
<td>12.5-25</td>
<td>Increase after a suitable trial</td>
<td>12.5-25</td>
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<td>1</td>
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<tr>
<td>Hydrochlorothiazide</td>
<td>12.5-25</td>
<td></td>
<td>12.5-25</td>
<td>25</td>
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<tr>
<td>Indapamide</td>
<td>1.25</td>
<td>Double dose every 4 weeks</td>
<td>1.25-2.5</td>
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<td>1</td>
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<tr>
<td><strong>Loop diuretics</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furosemide</td>
<td>20</td>
<td>Increase as tolerated</td>
<td>20-80</td>
<td>80</td>
<td>2</td>
</tr>
<tr>
<td>Bumetanide</td>
<td>0.5</td>
<td></td>
<td>0.5-2</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Torsemide</td>
<td>5</td>
<td></td>
<td>2.5-10</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td><strong>Beta-blockers (BB)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Atenolol</td>
<td>25</td>
<td></td>
<td>25-100</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>Metoprolol tartrate</td>
<td>50</td>
<td></td>
<td>50-100</td>
<td>200</td>
<td>2</td>
</tr>
<tr>
<td>Metoprolol succinate</td>
<td>25-50</td>
<td>Increase every 1-2 weeks</td>
<td>50-100</td>
<td>200</td>
<td>1</td>
</tr>
<tr>
<td>Nadolol</td>
<td>40</td>
<td></td>
<td>40-120</td>
<td>320</td>
<td>1</td>
</tr>
<tr>
<td>Propranolol</td>
<td>IR: 80</td>
<td></td>
<td>IR: 80-320</td>
<td>IR: 320</td>
<td>IR: 2</td>
</tr>
<tr>
<td></td>
<td>LA: 80</td>
<td></td>
<td>LA: 80-320</td>
<td>LA: 320</td>
<td>LA: 1</td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>2.5-5</td>
<td></td>
<td>5-10</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>12.5</td>
<td></td>
<td>12.5-50</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>Labetalol</td>
<td>100</td>
<td>Increase by 200 mg every 2-3 days</td>
<td>200-400</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td><strong>Aldosterone blocker</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spironolactone</td>
<td>25</td>
<td></td>
<td>12.5-25</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>Eplerenone</td>
<td>50</td>
<td></td>
<td>50-100</td>
<td>100</td>
<td>1-2</td>
</tr>
</tbody>
</table>
**UW Health Implementation**

**Potential Benefits:**
- Reduction in CVD morbidity and mortality with proper blood pressure control

**Potential Harms:**
- ACE-I Is and ARBs are contraindicated in patients who are pregnant
- Medication-specific side-effects such as lab abnormalities, syncope, hypotension
- Sleep disturbances or discomfort using out-of-office blood pressure monitoring devices

**Pertinent UW Health Policies & Procedures**
1. [UWMF Policy 102.097- Allied Health Blood Pressure Visit](#)

**Patient Resources**
1. [Health Facts For You #379- Heart Health: The DASH Diet](#)
2. [Health Facts For You #4462- High Blood Pressure](#)
3. [Health Facts For You #7761- Hypertension Medicines- ACE Inhibitors](#)
4. [Health Facts For You #7762- Hypertension Medicines- ARBs (Angiotensin Receptor Blockers)](#)
5. [Health Facts For You #7765- Hypertension Medicines- Beta-Blockers](#)
6. [Health Facts For You #7764- Hypertension Medicines- Calcium Channel Blockers](#)
7. [Health Facts For You #7763- Hypertension Medicines- Diuretics](#)
8. [Health Facts For You #7684- Taking Your Blood Pressure at Home](#)
9. [Health Facts For You #523- Heart Health: Resources for Heart- Healthy Living](#)
10. [Health Facts For You #6246- The Benefits of Exercise](#)
11. [Health Facts For You #5117- Potassium Sparing Diuretics](#)
12. [Health Facts For You #4678- Loop Diuretics (oral)](#)
13. [Health Facts For You #5041- Thiazide Diuretics (oral)](#)
14. [Health Facts For You #5817- Your Risk of Heart and Vascular Disease](#)
15. [Healthwise- Blood Pressure Test: Home](#)
16. [Healthwise- Blood Pressure: Elevated](#)
17. [Healthwise- Diet: DASH](#)
18. [Healthwise- Hypertension](#)
19. [Healthwise- Hypertension: General Info](#)
20. [Healthwise- Hypertension: Acute](#)
21. [Health Information- Angiotensin II Receptor Blockers (ARBs) for High Blood Pressure](#)
22. [Health Information- Angiotensin-Converting Enzyme (ACE) Inhibitors for High Blood Pressure](#)
23. [Health Information- Antihypertensive Medications, Deciding About](#)
24. [Health Information- Automated Ambulatory Blood Pressure Monitoring](#)
25. [Health Information- Beta-Blockers for High Blood Pressure](#)
26. [Health Information- Blood Pressure Screening](#)
27. [Health Information- Blood Pressure Monitoring at Home](#)
28. [Health Information- Blood Pressure Numbers: When to Get Help](#)
29. [Health Information- Calcium Channel Blockers for High Blood Pressure](#)
30. [Health Information- DASH Diet Sample Menu](#)
31. [Health Information- Direct Renin Inhibitors for High Blood Pressure](#)
32. [Health Information- Diuretics for High Blood Pressure](#)
33. [Health Information- High Blood Pressure: Should I Take Medicine?](#)
34. [Health Information- High Blood Pressure in African Americans](#)
35. [Health Information- High Blood Pressure Treatment Guidelines](#)
36. [Health Information- Home Blood Pressure Test](#)
37. [Health Information- Hypertension (High Blood Pressure)](#)
38. [Health Information- Hypertension: Checking your blood pressure at home](#)
39. [Health Information- Hypertension: Taking medicines properly](#)
40. [Health Information- Hypertension: Using the DASH diet](#)
41. [Health Information- Other Medicines for High Blood Pressure](#)
Guideline Metrics

WCHQ (2015)
1. CKD Screening- % of patients age 18-85 years with either diabetes or hypertension (excluding those with CKD and ESRD) who had an eGFR test during the last year.
2. Blood Pressure Control in CKD Stages I, II, III- % age 18-85 years with a diagnosis of CKD in stage I, II, or III (excluding those with CKD in stages IV or V or with ESRD) whose most recent blood pressure reading within the last year is controlled to a rate of < 140/90 mmHg.
3. Blood Pressure Control in CKD Stages IV, V- % age 18-85 years with a diagnosis of CKD in stage IV or V (excluding ESRD) whose most recent blood pressure reading within the last year is controlled to a rate of < 140/90 mmHg.
4. Blood Pressure Control in Diabetes- % age 18-75 years whose most recent blood pressure reading within the last year is controlled to a rate of < 140/90 mmHg.
5. Blood Pressure Control in IVD- % age 18-75 years with a diagnosis of IVD whose most recent blood pressure reading within the last year is controlled to a rate of < 140/90 mmHg.
6. High Blood Pressure- % age 18-85 years who have a diagnosis of essential hypertension and whose blood pressure was adequately controlled based on JNC 8 goals: < 140/90 mmHg for patients less than 60 years of age or patients of any age with a diagnosis of diabetes and/or chronic kidney disease; < 150/90 for patients 60 years of age and older without diabetes or chronic kidney disease.

ACO-MSSP (2016)
1. % of patients age 18-85 years who had a diagnosis of hypertension and whose blood pressure was adequately controlled (< 140/90 mmHg) during the measurement period.

Implementation Plan/Clinical Tools
1. Guideline will be posted on uConnect in a dedicated location for Clinical Practice Guidelines.
2. Release of the guideline will be advertised in the Physician/APP Briefing Newsletter.
3. Content and hyperlinks within clinical tools, documents, or Health Link related to the guideline recommendations (such as the following) will be reviewed for consistency and modified as appropriate.

Delegation Protocols
Hypertension Lab Ordering – Adult [78]; Antihypertensive Medication Titration [99]
Prescription Renewal Delegation Protocol- UW Health Primary Care Clinics

eConsults
UWOP ECONSULT TO CARDIOLOGY- HYPERTENSION [5626]

Order Sets & Smart Sets
Advanced Hypertension [5068]; Blood Pressure (Allied Health Visit) [5055]; HTN [5094];
Kidney- Hypertension Clinic [3285]

Reporting Workbench Report
Multi-condition Report

Smart Texts
Home BP Monitoring [34557]; Goal BP [34550]; Buy Home BP Cuff [34555]; BP Check [34546]
Disclaimer
Clinical practice guidelines assist clinicians by providing a framework for the evaluation and treatment of patients. This guideline outlines the preferred approach for most patients. It is not intended to replace a clinician’s judgment or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.

Appendix A. Evidence Grading Scheme(s)

Grading of Recommendations Assessment, Development and Evaluation (GRADE)

Figure 1. GRADE Methodology adapted by UW Health

<table>
<thead>
<tr>
<th>GRADE Ranking of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
</tr>
<tr>
<td>We are confident that the effect in the study reflects the actual effect.</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
</tr>
<tr>
<td>We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different.</td>
</tr>
<tr>
<td><strong>Low</strong></td>
</tr>
<tr>
<td>The true effect may differ significantly from the estimate.</td>
</tr>
<tr>
<td><strong>Very Low</strong></td>
</tr>
<tr>
<td>The true effect is likely to be substantially different from the estimated effect.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GRADE Ratings for Recommendations For or Against Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
</tr>
<tr>
<td>The net benefit of the treatment is clear, patient values and circumstances are unlikely to affect the decision.</td>
</tr>
<tr>
<td><strong>Weak/Conditional</strong></td>
</tr>
<tr>
<td>Recommendation may be conditional upon patient values and preferences, the resources available, or the setting in which the intervention will be implemented.</td>
</tr>
</tbody>
</table>
U.S. Preventive Services Task Force (USPSTF)

**USPSTF Grades for Recommendations**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>The USPSTF recommends the service. There is high certainty that the net benefit is substantial.</td>
</tr>
<tr>
<td>B</td>
<td>The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.</td>
</tr>
<tr>
<td>C</td>
<td>The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.</td>
</tr>
<tr>
<td>D</td>
<td>The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.</td>
</tr>
<tr>
<td>I Statement</td>
<td>The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.</td>
</tr>
</tbody>
</table>

American Diabetes Association (ADA)

**ADA Grading Scheme**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Description</th>
</tr>
</thead>
</table>
| A                 | Clear evidence from well-conducted, generalizable RCTs that are adequately powered, including:  
|                   | - Evidence from a well-conducted multicenter trial  
|                   | - Evidence from a meta-analysis that incorporated quality ratings in the analysis  
|                   | Compelling non-experimental evidence, i.e., “all or none” rule developed by the Center for Evidence-Based Medicine at the University of Oxford  
|                   | Supportive evidence from well-conducted RCTs that are adequately powered, including:  
|                   | - Evidence from a well-conducted trial at one or more institutions  
|                   | - Evidence from a meta-analysis that incorporated quality ratings in the analysis  |
| B                 | Supportive evidence from well-conducted cohort studies  
|                   | - Evidence from a well-conducted prospective cohort study or registry  
|                   | - Evidence from a well-conducted meta-analysis of cohort studies  
|                   | Supportive evidence from a well-conducted case-control study  |
| C                 | Supportive evidence from poorly controlled or uncontrolled studies  
|                   | - Evidence from randomized clinical trials with one or more major of three or more minor methodological flaws that could invalidate the results  
|                   | - Evidence from observational studies with high potential for bias (such as case series with comparison with historical controls)  
|                   | - Evidence from case series or case reports  
|                   | Conflicting evidence with the weight of evidence supporting the recommendation  |
| E                 | Expert consensus or clinical experience  |
Appendix B. Home Blood Pressure Monitoring

Home Blood Pressure Monitoring

Monitoring your blood pressure at home can provide very helpful information for you and your medical team. It can help you keep track of trends and make sure your blood pressure stays within goal ranges. It lets you alert us when you think your medications may not be working well, and helps assure us when your treatment is within targeted goals.

The best blood pressure cuffs are those that
1. Fit on your upper arm, not your wrist or finger.
2. Are not too tight.
3. Are all digital, meaning they don’t have bulbs to pump up or needles to read.

When you take a home blood pressure measurement, please follow the American Heart Association directions on the enclosed card. It is important to:
1. Not eat, drink caffeinated beverages or alcohol, or exercise for 30 minutes prior.
2. Sit comfortably on a chair with your back supported and feet on the ground for at least 5 minutes before measuring.
3. Take 2 blood pressure measurements at least a minute apart and record them both, unless instructed otherwise.
4. Record your heart rate and any other warning (like irregular heart beat) as well. If you have irregular heart beat warnings that are unexpected, please contact your health care provider.

Don’t take your blood pressure more often than instructed by your health care professional, unless you think you are having symptoms that might be related to your blood pressure.

Here are some brands and models that Consumer Reports reviewed in 2015. They are available from WallMart, Rite-Aid, Walgreens, and other stores, as well as online dealers. They also may have similar models.
- Omron 10 Series BP786
- Rite Aid Deluxe-Automatic BP3AR1-4D Rite
- ihealth Dock BP3
- LifeSource Advanced One Step UA-767PVL, UA-767PV, UA-767PVS
- A&D Medical UA767F
- ReliOn BP200 HEM741CRELN3

In addition, here are a few brands they reviewed and recommended in October, 2011.
- Omron 5 series BP742
- Walgreen’s Deluxe WGNBPA-540
- Wal-Mart ReliOn HEM-741CREL

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Copies of this and related documents are available at www.HealthDecision.org
References


2016 Hypertension Guideline: Key Practice Recommendations

### Blood Pressure Screening

<table>
<thead>
<tr>
<th>When to Screen</th>
<th>Adults ≥ 18 years old without known hypertension (HTN) should be screened for high blood pressure. <em>(USPSTF Grade A)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening Interval</td>
<td>Adults ≥ 40 years old and all those at increased risk for high blood pressure should be rescreened annually.</td>
</tr>
<tr>
<td>Screening Interval</td>
<td>Patients aged 18-39 years with normal blood pressure (&lt; 130/85 mm Hg), and no other cardiovascular disease (CVD) risk factors, should be rescreened every 3-5 years.</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• High-normal blood pressure/pre-hypertension (130-139/85-89 mm Hg)</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• Overweight or obesity (BMI ≥ 25 kg/m² or ≥ 23 kg/m² in Asian-Americans)</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• Diabetes mellitus or impaired fasting glucose</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• Tobacco use</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• African American ancestry</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• Family history of hypertension</td>
</tr>
<tr>
<td>Risk factors:</td>
<td>• Secondary causes of hypertension</td>
</tr>
</tbody>
</table>

### Establishing the Diagnosis

1. It is important to consider all blood pressure measurements in the clinical context of the patient (e.g., elevated measurement expected during acute injury such as a broken wrist or hypotension during dehydration).

2. The diagnosis of hypertension should be based on the presence of **two or more elevated blood pressures readings** (≥ 140/90 mm Hg in a clinic setting), as multiple measurements over time have better predictive value for the diagnosis of hypertension than a single measurement. The USPSTF recommends obtaining blood pressure measurements **outside of the clinical setting to confirm a new diagnosis of hypertension before starting treatment**. *(USPSTF Grade A)* Additional out-of-clinic readings are also recommended in patients suspected of having "white coat" or “masked” hypertension. *(UW Health Moderate quality evidence, strong recommendation)*

3. Out-of-clinic blood pressure readings may be obtained via ambulatory blood pressure monitoring (ABPM) or extended home blood pressure monitoring (HBPM). *(USPSTF Grade A)*
   - 24-hour ABPM is offered by the UW Preventive Cardiology Clinic (608-263-7420).
   - During HBPM, patients should initially monitor their home blood pressure 1-2 times per day at various times of the day, at least 5 times per week, over a 1-2 week period. *(UW Health Low quality evidence, weak/conditional recommendation)* Encourage patients to bring their home blood pressure readings to their next follow-up visit.
   - All patients should be advised to use a home blood pressure cuff. The home blood pressure monitor should be automated, digital and have an upper arm cuff (not wrist or fingertip). *(UW Health Moderate evidence, strong recommendation)* Mobile health technologies including smartphone apps should NOT be used. *(UW Health Low quality evidence, strong recommendation)*

### Target Blood Pressure Goals

<table>
<thead>
<tr>
<th>BLOOD PRESSURE GOALS (mmHg)</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOME</td>
<td>&lt; 135/85</td>
</tr>
<tr>
<td>OFFICE</td>
<td>&lt; 140/90</td>
</tr>
</tbody>
</table>

### Additional Considerations

- A lower office systolic goal of < 130 mmHg may be considered in patients with LVEF < 40%, congestive heart failure, diabetes mellitus (< 40 years of age, albuminuria, and/or those with one or more additional atherosclerotic CVD risk factor), and CKD with proteinuria (urine protein/Cr ratio > 1 or > 0.22 in African-Americans)
- Work towards a systolic goal of 120 mmHg in patients > 50 years old with SBP > 130-180 mmHg and history of CVD or with increased CVD risk* unless contraindicated**

*Increased CVD risk (one of the following): peripheral artery disease, AAA ≥ 5 cm, 10-year Framingham Risk Score ≥15%, age ≥75 years, left ventricular hypertrophy, ankle-brachial index ≤ 0.9, increased coronary artery calcification (score ≥ 400 Agatston units), abnormal stress test (with or without imaging), 50% or greater coronary or carotid artery stenosis, CKD without proteinuria (eGFR 20-59 ml/min/1.73 m²)

**Contraindications: High antihypertensive medication burden or intolerance to current regimen; one minute standing SBP <110 mmHg; history of stroke; diabetes mellitus; organ transplant; pregnancy; < 3 years expected survival; residing in a skilled nursing facility; difficulty with medication adherence including alcohol abuse, psychiatric disease, history of non-compliance.
2016 Hypertension Guideline: Key Practice Recommendations

Monitoring and Lab Testing

1. Check creatinine and potassium levels 1-2 weeks after medication initiation, at each dose change, and every 12 months thereafter in patients on diuretics, ACE-Is, ARBs, or spironolactone. *(UW Health Low quality evidence, strong recommendation)*

2. Check serum sodium after diuretic (including spironolactone) initiation, at each dose change, and as needed to evaluate for hyponatremia. *(UW Health Low quality evidence, strong recommendation)*

3. Patients who are not at goal (and not undergoing medication adjustments) should be seen in the clinic for assessment by a RN, APP, or MD at least every 3 months, whereas patients at goal may be seen annually. *(UW Health Very low quality evidence, weak/conditional recommendation)* All patients may be seen more frequently if deemed necessary per the results of prior clinical assessments or need for medication adjustments.

4. Treatment decisions, including medication adjustments, should be based on office blood pressure measurements that are considered within the full clinical context of each individual patient. Ongoing home blood pressure monitoring (in addition to clinic measurements) is recommended, as needed, to provide additional information for assessing treatment response or for changes in clinical status. *(UW Health Moderate quality evidence, strong recommendation)*

5. Patients should be encouraged to bring their home blood pressure cuff to clinic as an educational opportunity (e.g., to avoid improper use, evaluate appropriate size, etc.) and to consider comparing office and home monitoring equipment (e.g., large discrepancies in measurement). *(UW Health Very low quality evidence, weak/conditional recommendation)*

---

**Figure 1. Initiation and Titration of Antihypertensive Medications**

Office blood pressure ≥ 140/90 mmHg in adults aged 18 years or older (Recommended to confirm diagnosis with readings outside of the clinic)

Start Lifestyle Modifications (e.g., weight loss, physical activity, DASH-sodium diet, smoking cessation)

**Stage 1 Drug Therapy**
(140-159/90-99 mmHg)
(Consider a delay in uncomplicated Stage 1 patients*)

- **Black Patients**
  - CCB or Thiazide
  - If needed, add...
  - ACE-I or ARB
  - OR combine CCB + Thiazide

- **Non-Black Patients**
  - Age < 60 years?
    - Yes
    - ACE-I or ARB
    - If needed, add...
    - CCB or Thiazide
    - If needed...
  - No
    - CCB or Thiazide
    - If needed, add...
    - ACE-I or ARB
    - If needed...

- **CCB + Thiazide + ACE-I (or ARB)**
  - If needed, add...
  - Add other drugs (e.g., spironolactone; centrally acting agents; β-blockers)
  - If needed...

- Refer to Hypertension Specialist

**Stage 2 Drug Therapy**
(≥ 160/100 mmHg)

- **Special Cases**
  - Kidney disease
  - Diabetes
  - Coronary disease
  - Stroke history
  - Heart failure

  See Tables 6 and 7

- **All Patients**
  - Start with 2 drugs
  - CCB or Thiazide + ACE-I or ARB
  - If needed...

- **Black Patients**
  - CCB or Thiazide
  - If needed, add...
  - ACE-I or ARB
  - If needed...

- **Non-Black Patients**
  - Age < 60 years?
    - Yes
    - ACE-I or ARB
    - If needed, add...
    - CCB or Thiazide
    - If needed...
  - No
    - CCB or Thiazide
    - If needed, add...
    - ACE-I or ARB
    - If needed...

- **CCB + Thiazide + ACE-I (or ARB)**
  - If needed, add...
  - Add other drugs (e.g., spironolactone; centrally acting agents; β-blockers)
  - If needed...

- Refer to Hypertension Specialist

*Six months of monitored lifestyle modifications may be considered in patients with Stage 1 hypertension, without other cardiovascular risk factors or target organ damage, prior to initiating antihypertensive medications.*

CCB: calcium channel blocker; ACE-I: angiotensin-converting enzyme inhibitors; ARB: angiotensin receptor blocker
UW Health Referral Criteria for Workplace Hypertension (HTN) Screening

These general referral criteria are intended to provide guidance to clinical staff (e.g., RN) screening for hypertension (HTN) in workplace sites affiliated with UW Health clinics. They are general criteria that do not take into account underlying patient conditions or co-morbidities (e.g., presence of diabetes or kidney disease, etc.). In all cases, clinical staff conducting screening will use professional judgement and refer patients to their primary care physician (PCP) if/when concerns regarding blood pressure or other patient conditions warrant additional follow-up.

In particular, emergency medical services should be contacted for patients experiencing symptoms of hypoperfusion (e.g., lightheadedness, dizziness, nausea, clammy skin, blurry vision, loss of consciousness) or hypertension (e.g., hypertensive crisis, such as severe headaches, severe anxiety, shortness of breath, nosebleeds).

<table>
<thead>
<tr>
<th>Range</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 130/80 mmHg with symptoms of hypoperfusion</td>
<td>Call 911</td>
</tr>
<tr>
<td>&lt; 130/80 mmHg without symptoms of hypoperfusion</td>
<td>No action</td>
</tr>
<tr>
<td>130-139 / 80-89 mmHg and no blood pressure-related symptoms</td>
<td>Encourage lifestyle modification per UW Health HTN guideline and continue care with PCP</td>
</tr>
<tr>
<td>140-159 / 90-109 mmHg and no blood pressure-related symptoms</td>
<td>Refer to PCP to be seen within next 6 weeks</td>
</tr>
<tr>
<td>160-179 / 110-119 mmHg with no blood pressure-related symptoms</td>
<td>Refer to PCP to be seen within the next week</td>
</tr>
<tr>
<td>180-209 / 110-119 mmHg with no blood pressure-related symptoms</td>
<td>Refer to PCP to be seen within the 3 days</td>
</tr>
<tr>
<td>≥ 210/120 mmHg without blood pressure-related symptoms</td>
<td>Call PCP</td>
</tr>
<tr>
<td>≥ 210/120 mmHg with blood pressure-related symptoms</td>
<td>Call 911</td>
</tr>
</tbody>
</table>

Additional References:
- Refer to [UW Health Preventive Care Guideline](#) for information on blood pressure screening.
- Refer to [UW Health Hypertension Guideline](#) for information about blood pressure monitoring and treatment, including lifestyle modifications that can be recommended.