Diagnosis and Management of Hypertension – Adult – Clinical Practice Guideline

Target Population: Adults diagnosed with Hypertension

ACKNOWLEDGEMENT

This document has been produced as a collaborative effort between clinicians and quality improvement staff of Unity Health Insurance, Physicians Plus Insurance Corporation, the University of Wisconsin Medical Foundation, the Department of Family Medicine, and Group Health Cooperative. The guidelines are reviewed, revised and approved on an annual basis. This version was reviewed and approved in February 2014.
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Committee Approvals/Date: Clinical Knowledge Management Council / February 19, 2014

Physicians Plus QUM Committee: March 19, 2014

Release Date: February 27, 2014
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Executive Summary

Guideline Title:
Hypertension – Adult – Clinical Practice Guideline

Guideline Overview
A multi-disciplinary group has developed this clinical practice guideline to assist in identifying, diagnosing, treating, and monitoring adults 18 years and older with hypertension.

Target Population
Adult patients 18 years of age and older with hypertension

Practice Recommendations
1. Lifestyle modifications are the cornerstone of treatment for every patient. See Table 4 (Lifestyle Modifications). Educate all patients to limit their sodium intake to 1500 to 2000 mg/day.
2. Patients with a new diagnosis of hypertension should have an evaluation for possible secondary causes of hypertension, especially obstructive sleep apnea.
3. An ACE-inhibitor (or angiotensin receptor blocker) and/or a calcium channel blocker may be a more effective initial medication regimen than a thiazide or thiazide-type diuretic.
4. Chlorthalidone (12.5 to 25 mg daily) is the preferred thiazide-type diuretic, rather than hydrochlorothiazide (HCTZ).
5. Consider 24-hour ambulatory blood pressure monitoring* or extended home blood pressure monitoring for patients in whom white-coat or masked hypertension is suspected, or in whom the diagnosis of hypertension or need for medications is uncertain (services offered by UW Preventive Cardiology 263-7420).
   
   * 24 hour ambulatory BP monitoring and home BP monitors may not be covered by insurance.

Companion Documents
None
Pertinent UW Health Policies & Procedures

UW Medication Foundation Blood Pressure Measurement Policy
https://uconnect.wisc.edu/servlet/Satellite?cid=1121776129045&pagename=B_EXTRANET_UWHC_POLICIES%2FFlexMember%2FShow_Policy&c=FlexMember

Scope

Disease/Condition(s): This Clinical Practice Guideline (CPG) focuses on hypertension in adult patients ages 18 years and older.

Clinical Specialty: The following clinical specialties may reference this CPG: Internal Medicine, Family Practice, Obstetrics/Gynecology, Cardiovascular Medicine, Nephrology, Neurology, Vascular Surgery, Cardiothoracic Surgery, and Neurosurgery.

Intended Users: Physicians, Nurse Practitioners/Advanced Practice Nurses, Physician Assistants

CPG objective(s): To reduce the incidence of stroke, myocardial infarction, congestive heart failure, and kidney failure by appropriately identifying and treating hypertension.

Target Population: Adult patients (≥18 years old) with hypertension

Interventions and Practices Considered: Screening for hypertension, lifestyle assessment and modification, appropriate blood pressure monitoring, medication therapy, and ongoing care of patients diagnosed with hypertension.

Major Outcomes Considered: Prevention of the complications of hypertension.

Guideline Metrics - Hypertension Performance Measures: *

Percentage of patients 18-79 years old with a diagnosis of hypertension whose blood pressure was <140/90 mmHg during the measurement year.

Denominator: Patients 18-79 years old with a diagnosis of hypertension.

Percentage of patients ≥80 years old with a diagnosis of hypertension whose blood pressure was <150/90 mmHg during the measurement year.

Denominator: Patients ≥80 years old with a diagnosis of hypertension.

* Based on ASH/ISH Guidelines¹
Methodology

The Hypertension – Adult – Clinical Practice Guideline was developed in 2007 by Patrick McBride, MD, MPH and James Stein, MD of the UW Health Preventive Cardiology Program: “Recognizing & Treating Hypertension – 2007 Clinical Practice Guidelines for Adults ≥18 years old”.

In preparation for this clinical practice update, the committee 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, the committee agreed that the 2014 update of the UW Health Hypertension – Adult – Clinical Practice Guideline will be based 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, a document which currently reflects the clinical practice consensus of this committee.

Cost Analysis:
No formal cost analysis was performed.

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, while 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, which represent the gold standard for determining efficacy and effectiveness.

Recommendations

1. Establish the Diagnosis

1.1. Blood pressure should be measured at each health care encounter. The diagnosis of hypertension should be based on the presence of elevated blood pressures readings (≥140/90 mmHg in a clinic setting) on two or more visits. Consider all blood pressure measurements in the clinical context of the patient. Follow-up for an elevated blood pressure should be completed within one month. When blood pressure is at goal, routine blood pressure measurements should be taken every 6 months.
1.2. Blood pressures obtained using proper technique with manual and/or validated automated devices are acceptable (See Pickering, et al. 2005 in reference list below).

1.3. Measure blood pressures after the patient has emptied their bladder, rested for 5 minutes, and use an appropriate-sized cuff. Too small of a cuff will result in a falsely high blood pressure – “pseudohypertension” – and a larger cuff should be used.

1.4. The patient should be seated comfortably with the back supported, legs uncrossed, and feet on the ground. The arm should rest comfortably and be supported at the level of the heart.

1.5. Blood pressures should be taken on the bare arm, NEVER over clothing.

1.6. To obtain an accurate manual blood pressure: inflate the cuff to a pressure 20 mmHg above the palpable radial pulse, then release cuff pressure at a rate of approximately 2 mmHg/second.

1.7. When two readings taken at the same time in the same arm are separated by more than 5 mmHg, additional readings should be taken and averaged.

1.8. At least 2 readings should be taken, 1 to 2 minutes apart. The average of two appropriate measurements should be used. When the average of two or more readings is elevated, hypertension is suspected.

1.9. Consider evaluating for orthostatic hypotension, especially in the elderly. After the patient has been supine for at least 5 minutes, measure the blood pressure and pulse in the supine position. Repeat the blood pressure and pulse at 1 and 3 minutes in the standing position (sitting, if unable to stand). Evaluate for symptoms, including dizziness, vision changes, and diaphoresis, at each stage. A drop in systolic blood pressure of ≥20 mmHg or diastolic blood pressure ≥10 mmHg within 3 minutes of standing (compared to supine readings) suggests orthostatic hypotension. A heart rate increase of at least 30 bpm after standing 3 minutes may suggest hypovolemia, independent of orthostatic hypotension.

1.10. Additional out-of-clinic readings are recommended in patients suspected of having “white coat” or “masked” hypertension. 24-hour Ambulatory (offered by UW Preventive Cardiology Clinic 263-7420) or extended home blood pressure monitoring is recommended in these patients, or in patients in whom the diagnosis is uncertain.

1.11. Home Blood Pressure Monitoring:

1.11.1 All patients should be advised to purchase a home blood pressure cuff. The home blood pressure monitor should be digital and have an upper arm (not wrist or fingertip) cuff.

1.11.2 Patients should bring their home blood pressure cuff to clinic for inspection every 1-2 years (evaluate appropriate size, proper patient use, and assess for wear and tear). Home and office cuff values should be compared, recognizing that neither may be correct or incorrect, and each is an estimate of true blood pressure.

1.11.3 When measuring, sit comfortably with the back supported and legs uncrossed, feet on the ground. The arm should rest comfortably and be supported at the level of the heart.
1.11.4 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 two week period.
1.11.5 A normal home blood pressure is ≤135/85 mmHg.
1.11.6 Encourage patients to bring their home blood pressure readings to their follow-up visit.

2. Patient Evaluation

Assess lifestyle and identify other cardiovascular disease (CVD) risk factors. Evaluate for the presence of target organ damage, CVD (Table 1), and potential secondary causes of hypertension (Table 2). For additional provider and patient Information, including patient handouts, go to www.healthdecision.org (accessed in Health Link in patient’s chart under the “more activity” section).

Table 1 – Cardiovascular Risk Factors and Target Organ Damage

<table>
<thead>
<tr>
<th>CARDIOVASCULAR 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>*Peripheral arterial disease</td>
</tr>
<tr>
<td>*Overweight (BMI &gt;25 kg/m²)</td>
<td>*Chronic kidney disease</td>
</tr>
<tr>
<td>*Physical inactivity</td>
<td>*Retinopathy</td>
</tr>
</tbody>
</table>

*Tobacco use includes smoking, chewing, or being exposed to secondhand smoke.

Fasting glucose or HgbA1C are appropriate to screen for diabetes mellitus.

Table 2 – Secondary Causes of Hypertension

<table>
<thead>
<tr>
<th>Obstructive sleep apnea (OSA)</th>
<th>Cushing syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic kidney disease</td>
<td>Primary aldosteronism</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>Pheochromocytoma</td>
</tr>
<tr>
<td>Parathyroid disease</td>
<td>Coarctation of the aorta</td>
</tr>
<tr>
<td>Renovascular disease/Renal artery stenosis</td>
<td>Illicit stimulants (amphetamines, methamphetamines, and cocaine)</td>
</tr>
<tr>
<td>Medications (stimulants, estrogen, corticosteroids, erythropoietin alfa, mineralocorticosteroids, cyclosporine, tacrolimus)</td>
<td>Alcohol abuse</td>
</tr>
</tbody>
</table>

3. Treatment Goals: To prevent the complications of hypertension and set clear treatment goals based on the patient’s risk.

3.1. For uncomplicated hypertension, including patients with chronic kidney disease (CKD) without overt proteinuria and diabetes mellitus, the goal is <140/90 mmHg.

3.2. A goal of 130/80 mmHg should be considered for four subgroups of patients:

3.2.1* Those with CKD and proteinuria, defined as urine protein/creatinine ratio ≥1 (≥1 gram protein/24 hrs) or
urine protein/Cr ratio ≥0.3 if African-American (≥300mg/24 hrs)

3.2.2* Patients with diabetes and CKD (GFR <45 mL/min) even without overt proteinuria

* Many nephrologists recommend <130/80 mmHg for patients with CKD

3.2.3 Younger patients (18-55 years old)
3.2.4 Patients with LV systolic dysfunction (LVEF ≤40%)

3.3. For patients ≥80 years old, the goal is <150/90 mmHg. Consider a goal of <140/90 mmHg for patients ≥80 years old with diabetes or chronic kidney disease if the benefits outweigh the risks. Based on ASH/ISH Guidelines.¹

3.4. Table 3 – Blood Pressure Classifications and Management

<table>
<thead>
<tr>
<th>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>

Blood pressure is strongly related to CVD mortality. Compared to patients with normal blood pressure, there is a doubling of CVD risk in patients with pre-hypertension. Systolic hypertension is more predictive of events than diastolic blood pressure, especially in patients over 40 years old.

4. Lifestyle Modifications

In patients with Stage 1 hypertension, without other cardiovascular risk factors or target organ damage, 6 months of monitored lifestyle modifications may be considered prior to initiating an antihypertensive medication.

Lifestyle modifications are the cornerstone of treatment (Table 4). They can be as effective as pharmacological monotherapy and may mitigate the need for drug or multi-drug treatment. They may reduce the number and dose of antihypertensive medications and can be as or more effective than drug monotherapy. Providers should consider referrals to registered dieticians and exercise experts to help patients initiate lifestyle changes. The DASH-Sodium diet is best to lower blood pressure. The Mediterranean diet is for cardiovascular health. Lifestyle changes should be reinforced at every patient encounter, even after medication initiation.
DASH-Sodium diet handout:

Mediterranean diet handout:
### Table 4 – 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><strong>Weight</strong> (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><strong>Alcohol</strong> (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><strong>Physical Activity</strong> (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).</td>
</tr>
<tr>
<td><strong>DASH-Sodium diet</strong> (2-8 mmHg)</td>
<td>Limit to 1500 mg-2000 mg/day.</td>
<td>African-Americans, older patients, and people with hypertension or 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.</td>
</tr>
<tr>
<td><strong>Potassium, Magnesium, and Calcium</strong></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. Most salt substitutes contain potassium. Although useful for some patients, salt substitutes and high potassium diets should not be used in patients with stage 4 or 5 chronic kidney disease. They should be used with caution in patients on ACE inhibitors, angiotensin II receptor blockers, or aldosterone antagonists.</td>
</tr>
<tr>
<td><strong>Tobacco and second-hand smoke</strong></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>

For hypertension specialty consultants, contact Meriter Wisconsin Heart, 2601 W. Beltline Hwy., Suite 200, Madison, WI 53713, Phone: 608-417-2100. Merter Nutrition Services located at Merter Wellness Center (608-417-6102). Consult local facilities and providers for additional resources in your area.
Table 5: Treatment of Hypertension With and Without Compelling Indications
(reference: 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)

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>First Drug</th>
<th>Add Second Drug If Needed to Achieve a BP of &lt;140/90 mm Hg</th>
<th>If Third Drug is Needed to Achieve a BP of &lt;140/90 mm Hg</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&lt;sup&gt;a&lt;/sup&gt; or thiazide diuretic</td>
<td>ARB&lt;sup&gt;b&lt;/sup&gt; 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: Younger than 60</td>
<td>ARB&lt;sup&gt;b&lt;/sup&gt; or ACE inhibitor</td>
<td>CCB&lt;sup&gt;a&lt;/sup&gt; or thiazide diuretic</td>
<td>Combination of CCB + ACE inhibitor or ARB + thiazide diuretic</td>
</tr>
<tr>
<td>White and other non-black patients: 60 y and older</td>
<td>CCB&lt;sup&gt;a&lt;/sup&gt; or thiazide diuretic (Although ACE inhibitors or ARBs are also usually effective)</td>
<td>ARB&lt;sup&gt;b&lt;/sup&gt; or ACE inhibitor (or 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</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&lt;sup&gt;c&lt;/sup&gt;</td>
<td>The alternative second drug (thiazide or CCB)</td>
</tr>
<tr>
<td>Hypertension and clinical coronary artery disease&lt;sup&gt;d&lt;/sup&gt;</td>
<td>β-Blocker plus ARB or ACE Inhibitor</td>
<td>CCB or thiazide diuretic</td>
<td>The alternative second step drug (thiazide or CCB)</td>
</tr>
<tr>
<td>Hypertension and stroke history&lt;sup&gt;e&lt;/sup&gt;</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 + β-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.

<sup>a</sup>CCBs are generally preferred, but thiazides may cost less.

<sup>b</sup>ARBs can be considered because ACE inhibitors can cause cough and angioedema, although ACE inhibitors may cost less.

<sup>c</sup>If eGFR <40 mL/min, a loop diuretic (eg, furosemide or torsemide) may be needed.

<sup>d</sup>Note: If history of myocardial infarction, a β-blocker and ARB or ACE inhibitor are indicated regardless of blood pressure.

<sup>e</sup>Note: If using a diuretic, there is good evidence for indapamide (if available).

**See Table 6 for additional information on managing heart failure and chronic kidney disease**
### Table 6 – Compelling Indicators: Heart Failure and Chronic Kidney Disease

<table>
<thead>
<tr>
<th>HEART FAILURE</th>
<th>CHRONIC KIDNEY DISEASE (CKD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ACE-I (or ARB) is indicated in nearly all patients with LV systolic dysfunction.</td>
<td>Stages of Chronic Kidney Disease</td>
</tr>
<tr>
<td>• 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.</td>
<td>Stage</td>
</tr>
<tr>
<td>• Beta Blockers (carvedilol and metoprolol succinate) in nearly all patients with LV systolic dysfunction Titrate to target heart failure doses.</td>
<td>1</td>
</tr>
<tr>
<td>• Consider spironolactone after the patient is placed on the maximum doses of ACE-I and beta-blocker, especially if Class III or IV.</td>
<td>2</td>
</tr>
<tr>
<td>• Diuretics (usually loop) are often required for fluid management.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</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/1.73 m²) higher doses of loop diuretics may be needed in combination with other drug classes.
5. Medication Treatment

*Consider starting 2 medications for patients with blood pressures >20/10 mmHg above goal.* (See Figure 1: Initiation and Treatment of Antihypertensive Medication)

- Note that most patients with hypertension require 2-3 drugs to get to target.
- Monitor for possible side effects of medication to help assure patient compliance.

5.1 DIURETICS

5.1.1 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).

5.1.2 Diuretics should be considered part of all triple medication regimens, though do not need to be the first or second line medication, as previously recommended. They are especially useful in patients with edema, who are overweight, or in the elderly.

5.1.3 Chlorthalidone (12.5-25 mg daily) is the preferred thiazide-type diuretic – it is longer acting and a more potent antihypertensive than hydrochlorothiazide (HCTZ); however more careful monitoring for electrolyte and renal disturbances is needed.

5.1.4 Diuretics are synergistic with other classes of antihypertensive medications.

5.1.5 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).

5.1.6 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.

5.1.7 High dose diuretics can worsen insulin resistance and dyslipidemia in susceptible individuals, such as those with diabetes mellitus or the metabolic syndrome.

5.2 ACE-I AND ARB

5.2.1 Use long-acting agents for once per day dosing. Losartan is the weakest ARB and is best dosed twice daily.

5.2.2 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.
5.2.3 ARB’s are alternatives for patients with ACE-I associated cough or angioedema.
5.2.4 In patients with chronic kidney disease, use ACE-I or ARB.
5.2.5 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.
5.2.6 Contraindicated in pregnant patients. Women of child-bearing potential should be counseled about risks of pregnancy.
5.2.7 Avoid combining ACE-Is with ARBs; this combination can increase a patient’s risk for adverse renal events.

5.3 CALCIUM CHANNEL BLOCKERS
5.3.1 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.
5.3.2 Do not use short-acting nifedipine.

5.4 ALDOSTERONE ANTAGONISTS
5.4.1 Low dose spironolactone (12.5-25 mg qAM) 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.

5.5 BETA-BLOCKERS
5.5.1 No longer recommended as a first-, second- or third-line antihypertensive agent unless there is a compelling indication (i.e., coronary artery disease, LV systolic dysfunction, atrial fibrillation rate control).
5.5.2 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).
5.5.3 Can worsen insulin resistance and dyslipidemia in susceptible individuals, such as those with diabetes mellitus or the metabolic syndrome.
5.5.4 Beta-blockers should be used cautiously in patients with type I diabetes because of the potential to mask hypoglycemia.
Figure 1. Initiation and Titration of Antihypertensive Medication
(See Tables 5 and 6 for Compelling Indications)

<table>
<thead>
<tr>
<th>Medication (Names in bold indicate UWHC formulary medication)</th>
<th>Starting Dose (mg)</th>
<th>Dose Adjustment Schedule</th>
<th>Usual Dose (mg)</th>
<th>Max Dose (mg)</th>
<th>Doses per Day</th>
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<tbody>
<tr>
<td><strong>Angiotensin-converting enzyme inhibitors (ACEI)</strong></td>
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<tr>
<td>Benazepril</td>
<td>5-10</td>
<td>Increase every 1-2 weeks</td>
<td>10-40</td>
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<tr>
<td>Enalapril</td>
<td>2.5-5</td>
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<td>5-40</td>
<td>40</td>
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<td>Lisinopril</td>
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<td>Quinapril</td>
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<td>Consider lower starting dose when receiving concomitant diuretics or in volume depleted state</td>
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<td><strong>Angiotensin II receptor blockers (ARB)</strong></td>
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<td>Losartan</td>
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<td>Increase every 1-4 weeks</td>
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<td>Valsartan</td>
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<tr>
<td>Consider lower starting dose when receiving concomitant diuretics or in volume depleted state</td>
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<td><strong>Calcium channel blockers (CCB) - Dihydropyridine</strong></td>
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<tr>
<td>Amlodipine</td>
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<td>Increase in 2.5 mg increments every 1-2 weeks</td>
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<tr>
<td>Nifedipine ER</td>
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<td>Increase every 1-2 weeks</td>
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<tr>
<td>Felodipine</td>
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<td>Increase in 5 mg increments every 1-2 weeks</td>
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<td>Diltiazem ER</td>
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<td>Increase every 2 weeks</td>
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<td>Chlorothalidone</td>
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<td>Increase after a suitable trial</td>
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<td>Double dose every 4 weeks</td>
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<td><strong>Loop diuretics</strong></td>
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<tr>
<td>Furosemide</td>
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<td>Increase every 1-2 weeks</td>
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</tbody>
</table>
6. Laboratory Evaluations

6.1 Diuretics, ACE-I, ARB, spironolactone – Check BUN, serum creatinine, and potassium 1-2 weeks after initiation, at each dose change, and every 12 months thereafter. More frequent monitoring may be needed if symptoms suggest renal or electrolyte disorders.

6.2 Fasting glucose every 12 months, only as clinically indicated.

6.3 More frequent monitoring is recommended if other drugs that affect renal function or potassium homeostasis are being used. For CKD patients in stages IV & V, refer to Nephrology for lab monitoring.

6.4 Lipid panel (fasting) screening for all patients every 12 months.

Benefits/Harms of Implementation

Potential Benefits:
1. 1 in 3 adults in the United States has hypertension.
2. Hypertension is a major cardiovascular disease risk factor, increasing the incidence of heart failure, chronic kidney disease, stroke, and myocardial infarction.
3. Clinical trials have conclusively demonstrated that control of hypertension reduces cardiovascular disease morbidity and mortality.

Potential Harms:
1. ACE-inhibitors and angiotensin receptor blockers are contraindicated in pregnant patients.
2. Serial monitoring of kidney function and potassium is required when ACE-inhibitors, angiotensin receptor blockers, and/or diuretics (including aldosterone antagonists) are initiated or titrated.

Implementation Tools/Plan
1. This guideline will be housed in UConnect in a dedicated folder for Clinical Practice Guidelines.
2. Advertise release of this guideline in the Center for Knowledge Management corner within the Best Practices Newsletter.
3. A direct email to all Clinic Managers will be drafted to advertise release of new Clinical Practice Guideline.
4. Links to this guideline will be created in appropriate Health Link tools.

Disclaimer
CPGs are described to assist clinicians by providing a framework for the evaluation and treatment of patients. This Clinical Practice 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.

Patient and Provider Resources

1. American Heart Association: High Blood Pressure Patient Center
   http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/High-Blood-Pressure_UCM_002020_SubHomePage.jsp
2. National Heart, Lung, and Blood Institute Dietary Approaches to Stop Hypertension (DASH) Diet:

References


16. American Heart Association: High Blood Pressure Patient Center. [http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/High-Blood-Pressure_UCM_002020_SubHomePage.jsp](http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/High-Blood-Pressure_UCM_002020_SubHomePage.jsp)


