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Institute for Clinical Systems Improvement

Health Care Guideline

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- physicians, nurses, and other health care professional and provider organizations;
- health plans, health systems, health care organizations, hospitals and integrated health care delivery systems;
- medical specialty and professional societies;
- researchers;
- federal, state and local government health care policy makers and specialists; and
- employee benefit managers.

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This *ICSI Health Care Guideline* is designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and is not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. An *ICSI Health Care Guideline* rarely will establish the only approach to a problem.

Health Care Guideline:
Hypertension Diagnosis and Treatment

INSTITUTE FOR CLINICAL SYSTEMS IMPROVEMENT

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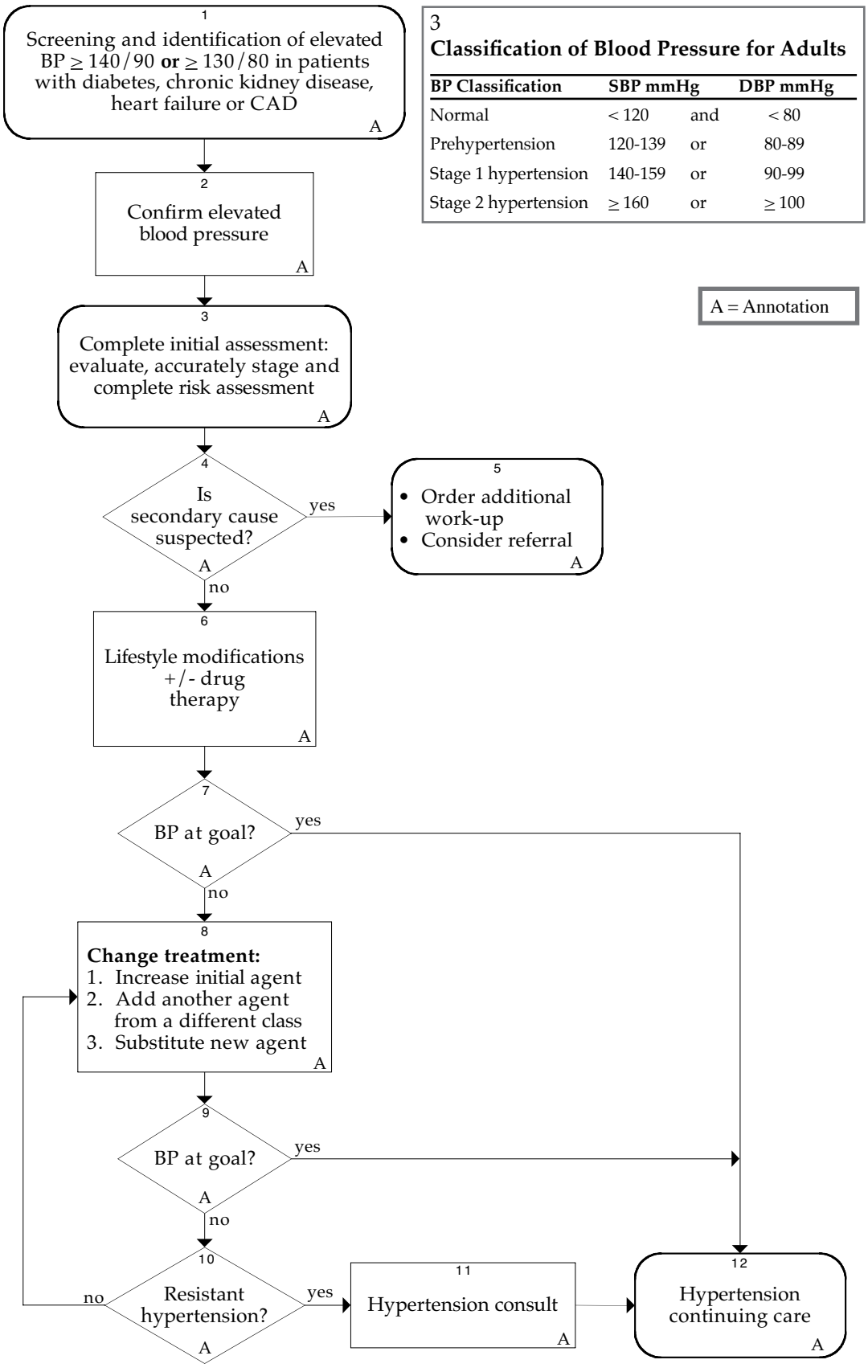

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Classification of Blood Pressure for Adults

BP Classification	SBP mmHg		DBP mmHg
Normal	< 120	and	< 80
Prehypertension	120-139	or	80-89
Stage 1 hypertension	140-159	or	90-99
Stage 2 hypertension	≥ 160	or	≥ 100

A = Annotation

These clinical guidelines are designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and are not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. A guideline will rarely establish the only approach to a problem.

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Foreword

Scope and Target Population

Adults age 18 or older.

Clinical Highlights and Recommendations

- Confirmation of hypertension is based on the initial visit, plus two follow-up visits with at least two blood pressure measures at each visit. *(Annotation #2)*
- Standardized blood pressure measurement techniques (including out-of-office or home blood pressure measurements) should be employed when confirming an initially elevated BP and for all subsequent measures during follow-up and treatment for hypertension. *(Annotation #2, Appendix B)*
- A thiazide-type diuretic should be considered as initial therapy in most patients with uncomplicated hypertension. (*Annotation #6)*
- Physician reluctance to intensify treatment is a major obstacle to achieving treatment goals. *(Annotations #8, 10)*
- Systolic blood pressure level should be the major factor for the detection, evaluation and treatment of hypertension, especially in adults 50 years and older. (*Annotation #7)*
- Fewer than 50% of patients with hypertension will be controlled with a single drug. *(Annotation #8)*

Priority Aims

1. Increase the percentage of patients in blood pressure control.
2. Improve the assessment of patients with hypertension.
3. Increase the percentage of patients not at blood pressure goal who have a change in subsequent therapy.
4. Increase the percentage of patients with hypertension who receive patient education, especially in the use of non-pharmacological treatments.

Related ICSI Scientific Documents

Related Guidelines

- Diagnosis and Initial Treatment of Ischemic Stroke
- Diagnosis and Treatment of Obstructive Sleep Apnea
- Heart Failure in Adults
- Lipid Management in Adults
- Management of Type 2 Diabetes Mellitus
- Preventive Services for Adults
- Stable Coronary Artery Disease
- Tobacco Use Prevention and Cessation for Adults and Mature Adolescents
- Atrial Fibrillation
- Diagnosis and Treatment of Chest Pain and Acute Coronary Syndrome (ACS)
- Prevention and Management of Obesity

Technology Assessment Reports

- Gastric Restrictive Surgery for Morbid Obesity (#14, 2000)
- Pharmacological Approaches to Weight Loss in Adults (#71, 2003)
- Behavioral Therapy Programs for Weight Loss in Adults (#87, 2005)
- Diet Programs for Weight Loss in Adults (#83, 2004)
- Treatment of Obesity in Children and Adolescents (#90, 2005)

Patient and Family Guidelines

- Heart Failure in Adults for Patients and Families
- Hypertension Diagnosis and Management for Patients and Families
- Lipid Management in Adults for Patients and Families
- Management of Type 2 Diabetes Mellitus for Patients and Families
- Preventive Services for Adults for Patients and Families
- Prevention and Management of Obesity for Patients and Families
- Stable Coronary Artery Disease for Patients and Families
- Tobacco Use Prevention and Cessation for Adults and Mature Adolescents for Patients and Families

Evidence Grading

Individual research reports are assigned a letter indicating the class of report based on design type: A, B, C, D, M, R, X.

Key conclusions are assigned a conclusion grade: I, II, III, or Grade Not Assignable.

A full explanation of these designators is found in the Supporting Evidence section of the guideline.

Disclosure of Potential Conflict of Interest

In the interest of full disclosure, ICSI has adopted the policy of revealing relationships work group members have with companies that sell products or services that are relevant to this guideline topic. The reader should not assume that these financial interests will have an adverse impact on the content of the guideline, but they are noted here to fully inform readers. Readers of the guideline may assume that only work group members listed below have potential conflicts of interest to disclose.

No work group members have potential conflicts of interest to disclose.

ICSI's conflict of interest policy and procedures are available for review on ICSI's Web site at http://www.icsi.org.

Algorithm Annotations

1. Screening and Identification of Elevated BP Greater Than or Equal to 140/90, OR Greater Than or Equal to 130/80 in Patients with Diabetes, Chronic Kidney Disease, Heart Failure or CAD

The entry point to this guideline is through the ICSI Preventive Services guideline. Patients should receive routine blood pressure screening and identification of elevated blood pressure (BP) in the manner recommended in that guideline.

2. Confirm Elevated Blood Pressure

Key Points:

- All elevated blood pressure readings should be confirmed.
- A standardized blood pressure measurement process is important for correctly identifying hypertensive patients.

If an elevated blood pressure reading has been obtained, the blood pressure level should be confirmed. Confirmation is based on the initial visit, plus two follow-up visits with at least two blood pressure readings at each visit. Explain the rationale, emphasize the reason for return and the need for confirmation of elevated blood pressure. Unconfirmed hypertension should be coded with CPT code 796.2. Confirmation and follow-up recommendations are noted in the JNC7 Table, "Classification of Blood Pressure for Adults Aged 18 Years and Older" at the end of this Annotation.

Standardized Blood Pressure Measurement

Accurate, reproducible blood pressure measurement is important to allow comparisons between blood pressure values and to correctly classify blood pressure. Incorrectly labeling a hypertensive patient as normotensive may increase risk for vascular events, since risk rises with increasing blood pressure. Labeling a patient with normal blood pressure as a hypertensive can affect insurability, employment, morbidity from medications, loss of time from work, and unnecessary lab and physician visits.

(Hajjar, 2003; Pickering, 2005)

Standardized blood pressure technique should be employed when confirming an elevated reading and for all subsequent readings during follow-up and treatment for hypertension. See Appendix B, "Standards for Blood Pressure Measurement."

Confirmed elevated blood pressure should be classified as to the appropriate hypertension stage.

Ambulatory blood pressure monitoring (ABPM) provides information about BP during daily activities and sleep. It is particularly helpful in the assessment of white coat or office effect, i.e., patients with elevated office BP who lack evidence of hypertensive target organ damage, and who have normal out-of-office BP readings. This phenomenon may be present in 20% to 35% of patients diagnosed with hypertension *(Clement, 2003)*. In general, however, this diagnosis can be reliably established without ABPM in patients with elevated office readings who lack target organ damage, and who have accurately measured out-of-office BP readings that are consistently less than 135/85 mmHg. Other clinical situations in which ABPM may be helpful include the assessment of drug resistance, hypotensive symptoms, episodic hypertension and suspected autonomic dysfunction. ABPM also appears to predict subsequent cardiovascular events more reliably than office blood pressure measurements. ABPM may be inaccurate with atrial fibrillation.

Out-of-office or home blood pressure measurements also provide important information regarding the diagnosis and treatment of hypertension, and they are less expensive than ABPM. Home blood pressure readings are a stronger predictor of subsequent cardiovascular events than are office readings. In addition, the use of home blood pressure measurements might reveal the patient with "masked hypertension," i.e., normal office and elevated home readings. Fully automated devices using an appropriately sized upper arm cuff are preferred over aneroid devices or automated devices that measure blood pressure at the wrist or on the finger. Accuracy of the patient's automated device should be confirmed periodically (e.g., annually) by the patient's health care professional *(Bobrie, 2004; Canzanello, 2005)*.

Table 1.

JNC7 Classification of Blood Pressure for Adults Aged 18 Years and Older*

	Blood pressure, mm Hg		
Category	**Systolic (mm Hg)**		**Diastolic (mm Hg)**
Normal**	less than 120	and	less than 80
Prehypertension	120-139	or	80-89
Hypertension***			
Stage 1	140-159	or	90-99
Stage 2	greater than or equal to 160	or	greater than or equal to 100

* Not taking antihypertensive drugs and not acutely ill. When systolic and diastolic pressure fall into different categories, the higher category should be selected to classify the individual's blood pressure status. (Isolated systolic hypertension [ISH] is defined as SBP greater than or equal to 140 mm Hg and DBP less than 90 mm Hg and staged appropriately [e.g., 170/82 mm Hg is defined as Stage 2 ISH].) In addition to classifying stages of hypertension on the basis of average blood pressure levels, clinicians should specify presence or absence of target organ disease and additional risk factors. This information is important for risk assessment and treatment. (See JNC7 Table 6.)

** Optimal blood pressure with respect to cardiovascular risk is SBP less than 120 mm Hg and DBP less than 80 mm Hg. However, unusually low readings should be evaluated for clinical significance.

*** Based on the average of two or more readings taken at each of two or more visits after an initial screening.

The JNC7 report reflects the creation of a new classification, termed as "prehypertension," that is intended to identify individuals in whom early intervention of healthy lifestyle changes could reduce BP, decrease the rate of the progression of BP to hypertensive levels with age, or prevent hypertension entirely.

JNC7 has also combined stage 2 and stage 3 hypertension into a single stage 2 category. This change was made primarily because the management of the two former groups is similar.

Table 2. Recommendations for follow-up based on initial blood pressure measurements for adults without acute end organ damage

Initial Blood Pressure, mm Hg*	Follow-Up Recommended†
Normal	Recheck in two years
Prehypertension	Recheck in one year††
Stage 1 hypertension	Confirm within two months††
Stage 2 hypertension	Evaluate or refer to source of care within one month. For those with high pressures (e.g., greater than 180/110 mm Hg), evaluate and treat immediately or within one week depending on clinical situation and complications.

*If systolic and diastolic categories are different, follow recommendations for shorter time follow-up (e.g., 160/86 mm Hg should be evaluated or referred to source of care within one month).

† Modify the scheduling or follow-up according to reliable information about past BP measurements, other cardiovascular risk factors, or target organ disease.

†† Provide advice about lifestyle modifications (see Annotation 6, "Lifestyle Modifications +/- Drug Therapy").

Blood Pressure Screening Clarification

Because all stages of hypertension are associated with increased vascular events, the previous classifications of mild and moderate hypertension were discarded in favor of stages that emphasize these risks. The current classification emphasizes systolic as well as diastolic standards, as systolic hypertension has been associated with increased fatal and nonfatal cardiovascular events, and treatment has been shown to reduce cardiovascular morbidity and mortality *(Chobanian, 2003; Liu, 1998; SHEP Cooperative Research Group, 1991; Staessen, 1997; World Health Organization/International Society of Hypertension, 1999).*

A proposed follow-up schedule – based on the initial blood pressure level as well as prior diagnosis and treatment of cardiovascular disease and risk factors – is noted in JNC VI Table 3 *(Chobanian, 2003).*

Initial encounter is defined as an ICD-9 code of 796.2 ("Elevated blood pressure reading without diagnosis of hypertension. Note: this category is to be used to record an episode of elevated blood pressure in a patient in whom no formal diagnosis of hypertension has been made, or as an incidental finding").

This guideline encourages increased use of this 796.2 ICD-9 code because elevated BP without hypertension is currently believed to be under-reported.

Supporting evidence is of classes: A, B, C, D, R

3. Complete Initial Assessment: Evaluate, Accurately Stage and Complete Risk Assessment

Key Points:

- It is important to assess and accurately stage newly confirmed hypertension.
- A complete review of all medications (prescription and over-the-counter) and herbal supplements is very important.

The goal of the clinical evaluation in newly confirmed hypertension is to determine whether the patient has primary or secondary hypertension, target organ disease, and other cardiovascular risk factors (risk assessment).

Absolute risk of non-fatal and fatal cardiovascular diseases in individuals with hypertension is determined by the presence of non-hypertensive cardiovascular risk factors and the presence or absence of damage to the target organs of hypertension. The absolute risk increases progressively with the level of blood pressure, the number of non-hypertensive cardiovascular risk factors, and the severity and extent of target organ damage. Using information from the Framingham epidemiologic study, a 10-year coronary heart disease risk level can be estimated for an individual based on the combination of the individual's age, total and HDL-cholesterol levels, systolic blood pressure level, smoking status, and whether the individual has diabetes and LVH by EKG. (See Appendix D, "10-Year CVD Risk Calculator [Risk Assessment].") This method of risk assessment makes clear the need not only to control blood pressure but to prevent target organ damage and control all cardiovascular risk factors to maximize risk reduction.

The decision to treat hypertension initially with both lifestyle modification and drugs is reasonable when absolute individual risk is high.

More specific and recent values for the diagnosis and treatment of dyslipidemia are reviewed in the ICSI Lipid Management in Adults guideline.

A. Accurately Stage

This treatment guideline is designed to be used in new or previously diagnosed hypertensive patients in conjunction with the ICSI Preventive Services in Adults guideline. See Appendix B, "Standards for Blood Pressure Measurement."

Hypertension Stages	Systolic		Diastolic
Prehypertension	120-139	or	80-89
Stage 1 hypertension	140-159	or	90-99
Stage 2 hypertension	greater than or equal to 160	or	greater than or equal to 100

When systolic and diastolic pressure fall into different categories, the higher category should be selected in classifying the individual's blood pressure status.

B. Risk Assessment

The risk for cardiovascular disease in patients with hypertension is determined not only by the level of blood pressure, but also by the presence or absence of target organ damage and other risk factors such as smoking, dyslipidemia and diabetes, as shown in JNC 7. These factors independently modify the risk for subsequent cardiovascular disease, and their presence or absence is determined during the routine evaluation of patients with hypertension (i.e., history, physical examination, laboratory tests).

C. Medical History

The history should focus on modifiable lifestyle factors including weight change, dietary intake of sodium and cholesterol, level of exercise, psychosocial stressors and patterns of alcohol and tobacco use.

Determine all medications being used – including herbal supplements, over-the-counter, prescription and illicit drugs – as many agents may temporarily elevate blood pressure and/or adversely affect blood pressure control. See Appendix E, "Recommended Education Messages."

A family history of hypertension, cardiovascular disease, cerebrovascular disease, diabetes mellitus and dyslipidemia should be documented.

Assess for symptoms and signs of target organ disease and secondary hypertension via a directed history.

D. Physical Examination

The initial physical examination should include the following:

- Two or more blood pressure measurements separated by two minutes with the patient seated and after standing for at least two minutes in accordance with the recommended techniques as stated in Appendix B, "Standards for Blood Pressure Measurement";
- Verification in the contralateral arm (if values are different, the higher value should be used);
- Measurement of height, weight and waist circumference;
- Funduscopic examination for hypertensive retinopathy (i.e., arteriolar narrowing, focal arteriolar constrictions, arteriovenous crossing changes, hemorrhages and exudates, disc edema);
- Examination of the neck for carotid bruits, distended veins, or an enlarged thyroid gland;

- Examination of the heart for abnormalities in rate and rhythm, increased size, precordial heave, clicks, murmurs, and third and fourth heart sounds;
- Examination of the lungs for rales and evidence of bronchospasm;
- Examination of the abdomen for bruits, enlarged kidneys, masses, and abnormal aortic pulsation;
- Examination of the extremities for diminished or absent peripheral arterial pulsations, bruits, and edema;
- Neurological assessment.

E. Initial Laboratory Studies

Initial lab screen should include 12-lead ECG, urinalysis, fasting blood glucose, hematocrit, serum sodium, potassium, creatinine (or estimated or measured GFR), calcium and lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides). Additional laboratory and diagnostic studies may be required in individuals with suspected secondary hypertension and/or evidence of target organ disease.

Some of these tests are needed for determining presence of target organ disease and possible causes of hypertension. Others relate to cardiovascular risk factors or provide baseline values for judging biochemical effects of therapy.

Additional tests may be ordered at the discretion of the provider based on clinical findings. These may include but are not limited to CBC, chest x-ray, uric acid and urine microalbumin.

See Appendix A, "Clinical Evaluation of Confirmed Hypertension."

(Aw, 2005; Chobanian, 2003; Levy, 1993; Priya, 2000; Vasan, 2001; Wolf, 1991; World Health Organization/International Society of Hypertension, 1999)

JNC7* Cardiovascular Risk Factors/Target Organ Damage

Major risk factors
- Hypertension
- Age (older than 55 for men, 65 for women)†
- Diabetes mellitus**
- Elevated LDL cholesterol
- Low HDL cholesterol**
- Estimated GFR less than 60 mL/min***
- Microalbuminuria
- Family history of premature cardiovascular disease (men younger than 55 or women younger than 65)
- Obesity** (body mass index greater than or equal to 30 kg/m^2, waist circumference greater than 40 inches for men and greater than 35 inches in women)
- Physical inactivity
- Tobacco usage, particularly cigarettes

Target organ damage
- Heart
  - Left ventricular hypertrophy
  - Angina/prior myocardial infarction
  - Prior coronary revascularization
  - Heart failure
- Brain
  - Stroke or transient ischemic attack
  - Dementia
- Chronic kidney disease
- Peripheral arterial disease
- Retinopathy

* Modified from JNC7

† Increased risk begins at approximately 55 and 65 for men and women, respectively. Adult Treatment Panel III used earlier age cutpoints to suggest the need for earlier action.

** Components of the metabolic syndrome. Reduced HDL and elevated triglycerides are components of the metabolic syndrome. Abdominal obesity is also a component of metabolic syndrome.

*** GFR indicates glomerular filtration rate.

A point scale approach for estimating 10-year coronary heart disease risk can also be used. See Appendix D, "10-Year CVD Risk Calculator (Risk Assessment)."

Supporting evidence is of classes: B, R

4. Is Secondary Cause Suspected?

The term "secondary hypertension" implies that a patient's blood pressure elevation is the result of an underlying discoverable disease process. Secondary causes account for only a small percentage of all documented cases of hypertension, but their detection is important as appropriate intervention may be curative and lead to reversal of hypertension.

Evaluate for features suggestive of secondary hypertension. Suspect a diagnosis of secondary hypertension in patients with an abrupt onset of symptomatic hypertension, with Stage 2 hypertension, hypertensive crisis, sudden loss of blood pressure control after many years of stability on drug therapy, drug resistant hypertension, and in those individuals with no family history of hypertension. Differential diagnosis of secondary hypertension includes:

- Chronic kidney disease/obstructive uropathy;
- Thyroid and parathyroid disease;
- Drugs (prescription, over-the-counter, herbal supplements, illicit drugs);
- Excessive alcohol use;
- Obstructive sleep apnea;
- Primary aldosteronism;
- Renal artery stenosis;
- Pheochromocytoma;
- Cushing's syndrome;
- Aortic coarctation;
- Obesity.

See Appendix C, "Suspicion of Secondary Hypertension."

Note recommendations for additional diagnostic procedures. Be sure advanced testing is correctly chosen and done properly to avert the need for repeat studies. This may require discussion with or referral to a specialist.

5. Order Additional Work-Up/Consider Referral

Consider appropriate referral or additional work-up if secondary hypertension is identified or suspected.

If you suspect a diagnosis of secondary hypertension, it is recommended that you perform a phone consultation and/or refer the patient to a specialist early in order to confirm the most efficient and cost-effective approach to patient evaluation and management *(Chobanian, 2003; Gifford Jr, 1989)*.

Supporting evidence is of class: R

6. Lifestyle Modifications +/- Drug Therapy

Key Points:

- Lifestyle modifications should be the cornerstone of the initial therapy for hypertension.

Clinical studies show that the blood pressure-lowering effects of lifestyle modifications can be equivalent to drug monotherapy *(Elmer, 2006)*. Lifestyle modification is best initiated and sustained through an educational partnership between the patient and a multidisciplinary health care team. While team members may vary by clinical setting, behavior change strategies should include nutrition, exercise, and smoking cessation services. Lifestyle modifications should be reviewed and re-emphasized at least annually.

Some patient education should occur and be documented at every visit. For recommended education messages, see Appendix E, "Recommended Education Messages."

Table 3. Lifestyle Modifications to Prevent and Manage Hypertension*

Modification	Recommendation	Approximate SBP Reduction (Range)†
Weight reduction	Maintain normal body weight (body mass index 18.5-24.9 kg/m^2).	5-20 mm Hg/10 kg
Adopt DASH** eating plan	Consume a diet rich in fruits, vegetables and low-fat dairy products, with a reduced content of saturated and total fat.	8-14 mm Hg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2-8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30-45 minutes per day, most days of the week).	4-9 mm Hg
Moderation of alcohol consumption	Limit consumption to no more than two drinks (e.g., 24 oz. beer, 10 oz. wine, or 3 oz. 80 proof whiskey) per day in most men and to no more than one drink per day in women and lighter-weight persons.	2-4 mm Hg

*For overall cardiovascular risk reduction, stop smoking.

**DASH indicates Dietary Approaches to Stop Hypertension.

† The effects of implementing these modifications are dose- and time-dependent and could be greater for some individuals.

Weight Reduction and Maintenance

Hypertension is closely correlated with excess body weight. The prevalence of hypertension is 50% higher among overweight individuals, and 20% to 30% of hypertensive patients are overweight.

Research studies have documented the positive effects of weight reduction as a strategy for blood pressure control. Whenever indicated, weight reduction should be recommended either as an initial non-pharmacologic therapy or as an adjunct to pharmacologic therapy. The decrease in blood pressure is related to the amount of weight loss. However, even an initial loss of as little as 10 pounds can have a positive effect on blood pressure. Weight loss can also improve the efficacy of antihypertensive medications and the cardiovascular risk profile.

Initial weight loss and long-term weight control are both enhanced by a regular exercise program.

Patient education and/or nutritional counseling should be provided.

(Appel, 1997; Chobanian, 2003; Flegal, 2002; Moore, 2005; National High Blood Pressure Education Program Working Group, 1993; Trials of Hypertension Prevention Collaborative Research Group, The, 1992)

Moderation of Dietary Sodium

A relationship between dietary sodium intake and blood pressure has been demonstrated in multiple clinical and epidemiological studies. Modest sodium restriction may also reduce the amount of antihypertensive medications required.

However, individuals vary in response to a reduced sodium intake. Among hypertensives, African Americans, older patients and patients with renal disease seem to be more sodium sensitive.

(Appel, 2001; Law, 2000; Neaton, 1993; Sacks, 2001; Whelton, 1998)

Moderation of Alcohol Intake

Several epidemiological studies have demonstrated an association between alcohol consumption and blood pressure. Alcohol affects both systolic and diastolic pressures, but its effects appear to be greater on systolic pressure. Significant elevations in blood pressure have been shown in individuals who consumed an average of at least three standard drinks per day compared with non-drinkers. Alcoholism may cause hypertension, and the alcoholic is less likely to respond to any hypertension treatment recommendations. Some persons may develop transitory hypertension during the first days of detoxification. Alcohol is also a concentrated calorie source that does not provide any nutrients. Reducing alcohol intake can help with weight reduction and may decrease triglyceride levels. The recommendation is to not exceed a daily alcohol intake of one ounce of ethanol. One ounce (30 mL) of ethanol is equivalent to two drinks per day. It is recommended that men have no more than one ounce of ethanol per day (two drinks) and women have no more than 0.5 ounce of ethanol per day (one drink). One drink is 12 ounces of beer, 5 ounces of wine or 1.5 ounces of 80 proof liquor.

(Friedman, 1990; Maheswaran, 1991)

Adequate Physical Activity

Epidemiological studies suggest that regular aerobic physical activity may be beneficial for both prevention and treatment of hypertension, to enable weight loss, for functional health status, and to diminish all-cause mortality and risk of cardiovascular disease. 30-45 minutes of brisk walking most days of the week at target heart rate ([220-age] x 75% = target heart rate) is adequate, inexpensive and effective. Other aerobic activities (biking, swimming, jogging, etc.) may be more enjoyable. Resistive isotonic activities, when done as the only form of exercise training, are not recommended to lower blood pressure in hypertensive patients.

(Pate, 1995; World Hypertension League, 1991)

Potassium

There is no direct evidence that potassium supplementation lowers blood pressure chronically *(Cappuccio, 1991; Fotherby, 1992; Whelton, 1997).*

Tobacco Avoidance

Recent data using ambulatory blood pressure monitoring suggests that nicotine may indeed increase blood pressure and could account for some degree of blood pressure lability. In addition, it is a major risk factor for atherosclerotic cardiovascular disease. At each visit, establish tobacco use status and follow ICSI's Tobacco Use Prevention and Cessation guideline.

(Bolinder, 1998; Eisenberg, 1993; Johnston, 1991)

Relaxation and Stress Management

Although studies have not demonstrated a significant long-term effect of relaxation methods on blood pressure reduction, relaxation therapy may enhance an individual's quality of life and may have independent effects on lowering coronary heart disease risk.

Drug Therapy

A thiazide-type diuretic should be considered as initial therapy in most patients with uncomplicated hypertension. Diuretics have been shown to be as good or superior to other classes of drug therapy in preventing CVD morbidity and mortality, and they are inexpensive. Thiazide-type diuretics are especially useful for patients age 55 years or older with hypertension and additional risk factors for cardiovascular disease and for patients age 60 years or older with isolated systolic hypertension. In patients for whom diuretics are contraindicated or poorly tolerated, use of a beta-blocker, angiotensin-converting enzyme inhibitor, angiotensin receptor blocker, or calcium antagonist is appropriate. Long-acting dihydropyridine calcium antagonists have been shown to be effective for patients age 60 years or older with isolated systolic hypertension. Co-existing medical conditions may also justify the use of one of these classes of drugs. An example is the use of an angiotensin-converting enzyme inhibitor in a patient with heart failure or diabetic nephropathy. Please see ICSI's Management of Type 2 Diabetes Mellitus guideline for further information. Based on meta-analyses of previous studies, beta-blockers may be less efficacious than other first-line alternatives in patients who are 60 years and older, especially for stroke prevention. Thus, use of these drugs as initial therapy in older patients probably should be restricted to situations where there is another indication for their use (e.g., heart failure, previous MI, angina.) They still should be considered alternative first-line agents in younger patients, where they appear to lessen cardiovascular morbidity as well as other recommended drugs. Other classes of drugs should be reserved for special situations or as additive therapy (see Appendix F, "Therapies").

Many patients will require more than one drug for blood pressure control. Combination therapies that include a diuretic are often effective, lessen the risk for side effects (by use of low doses of each component drug), and enhance adherence by simplification of the treatment program. For patients with chronic kidney disease, three or more drugs may be needed to achieve goal.

Other considerations when selecting initial drug therapy include age, race, cost, drug interactions, side effects and quality of life issues. In general, diuretics and calcium channel blockers appear to be more effective as an initial treatment of hypertension in African Americans.

The lowest recommended dose of the chosen drug should be used initially. If tolerated, the dose can be increased or additional medications added to achieve goal blood pressure.

Because thiazide-type diuretics have been shown to be as good or superior to other drug classes in preventing CVD morbidity and mortality, they should be considered preferred initial therapy in most patients. However, studies support the use of specific alternative drugs as initial therapy in the presence of specific co-existing diseases. ACE inhibitors and angiotensin receptor blockers have been shown to be beneficial for patients with proteinuric renal disease (both diabetic and non-diabetic) by reducing proteinuria and slowing the rate of decline in renal function. ACEI have also been shown to provide symptomatic relief and prolong life for patients with heart failure (HF) and are the initial drug of choice for this condition. Beta-blockers reduce the risk of sudden death and recurrent myocardial infarction for patients with an initial MI. ACEI also reduce the risk of subsequent MI and progression to HF for patients who experience a large MI associated with impairment of left ventricular function. They also may reduce risk for patients with (or at high risk for) cardiovascular disease. Initial monotherapy with one of these agents is appropriate in these patient populations. A diuretic should be added if blood pressure response is not satisfactory.

Evidence from a recent large study refutes concerns about increased risk of myocardial infarction, cancer or gastrointestinal bleeding from use of long-acting calcium antagonists. However, data does suggest that this class of drugs may be less effective in preventing HF. We suggest these drugs be limited to those conditions listed in Appendix F, "Therapies." Data supporting potential dangers of calcium antagonists are limited to short-acting preparations (especially nifedipine) that are not approved for the treatment of hypertension.

Evidence from a recent large trial suggests that ACEI may be less effective in African Americans than thiazide-type diuretics in controlling blood pressure and in preventing stroke and cardiovascular disease.

(Agodoa, 2001; ALLHAT Officers, Coordinators for the ALLHAT Collaborative Research Group, The, 2000; ALLHAT Officers, Coordinators for the ALLHAT Collaborative Research Group, The, 2002; Appel, 2002; Borhani, 1996; Brenner, 2001; Chobanian, 2003; Curb, 1996; Dahlof, 2002; Dahlöf, 2005; Estacio, 1998; Gottlieb, 1998; Grimm, 1997; Heart Outcomes Prevention Evaluation Study Investigators, The, 2000; Jafar, 2001; Kostis, 1997; Lewis, 2001; Neaton, 1993; Parving, 2001; Pitt, 2003; PROGRESS Collaborative Group, The, 2003; Psaty, 2003; Rahman, 2005; Salpeter, 2002; SHEP Cooperative Research Group, 1991; Soumerai, 1997; Staessen, 1997; Staessen, 1998; STOP-Hypertension-2 Study Group, The, 1999; UK Prospective Diabetes Study Group, 1998; Whelton, 2005; Wing, 2003; Lindholm, 2005; Khan, 2006)

Supporting evidence is of classes: A, B, C, D, M, R

7. BP at Goal?

Key Points:

- Systolic hypertension in patients aged 60 and older is an important modifiable cardiovascular risk factor.
- Accurate home monitoring systems are an important tool for assessing blood pressure control.
- Review drugs, over-the-counter medications and herbal therapies that may interfere with BP goal.

Goal office blood pressures should be less than 140 mmHg systolic and less than 90 mmHg diastolic for all adults. Goal blood pressures measured out of the office setting should be less than 135 mmHg systolic and less than 85 mmHg diastolic.

For patients with a history of heart failure, goal office blood pressures are less than 130 mmHg systolic and less than 80 mmHg diastolic.

For patients with chronic kidney disease, goal office blood pressures are less than 130 mmHg systolic and less than 80 mmHg diastolic.

For patients with diabetes mellitus, goal office blood pressures are less than 130 mmHg systolic and less than 80 mmHg diastolic. Progressive reduction of systolic blood pressure to as low as 110 mmHg has been shown to be associated with lower risk of microvascular and macrovascular complications.

For patients 60 years or older with isolated systolic hypertension who have markedly increased systolic blood pressure levels prior to treatment, it may not be possible to lower systolic blood pressure to less than 140 mmHg. An interim goal of 160 mmHg or what can be achieved by optimal doses of three antihypertensive drugs would be reasonable.

Systolic hypertension in patients age 60 and older is an important modifiable cardiovascular risk factor. *[Conclusion Grade I: See Conclusion Grading Worksheet A – Annotation #7 (Isolated Systolic Hypertension)]*

Drug treatment for Stage 1 (SBP 140-159 mmHg) systolic hypertension in patients age 60 and older is effective in reducing cardiovascular disease morbidity and mortality. *[Conclusion Grade III: See Conclusion Grading Worksheet A – Annotation #7 (Isolated Systolic Hypertension)]*

Drug treatment for Stage 2 (SBP greater than or equal to 160-180 mmHg) systolic hypertension in patients age 60 and older is effective in reducing cardiovascular disease morbidity and mortality. *[Conclusion Grade Grade I: See Conclusion Grading Worksheet A – Annotation #7 (Isolated Systolic Hypertension)]*

Concerns have been raised that excessive lowering of diastolic blood pressure increases the risk of coronary events in patients with established coronary artery disease or left ventricular hypertrophy by lowering diastolic perfusion pressure in the coronary circulation. This is known as the J-curve hypothesis. Recent studies have also raised concerns about a J-curve relationship between diastolic blood pressure level and risk for stroke in elderly patients treated for isolated systolic hypertension. No such J-shaped relationship has been observed between adverse event rates and systolic blood pressure level. Although not resolved, caution should be applied in lowering diastolic blood pressure below 75 mmHg in patients with coronary artery disease or left ventricular hypertrophy, or below 65 mmHg in all elderly patients with isolated systolic hypertension. In the latter situation, this may require compromise of the goal level of systolic blood pressure achieved.

(Adler, 2000; Bakris, 2003; Farnett, 1991; Hansson, 1998; Hypertension Detection Follow-Up Program Cooperative Group, 1979; Hypertension Detection Follow-Up Program Cooperative Group, 1982; Izzo, 2000; Jafar, 2003; Lazarus, 1997; Messerli, 2006; Sarnak, 2005; Staessen, 2000; UK Prospective Diabetes Study Group, 1998; Vasan, 2002; Voko, 1999)

Supporting evidence is of classes: A, B, C, M, R

8. Change Treatment

Once a hypertensive drug therapy is initiated, most patients should return for follow-up and medication adjustments at least at monthly intervals until BP goal is reached.

Fewer than 50% of patients with hypertension will be controlled with a single drug.

If blood pressure goals are not met, the clinician has three options for subsequent therapy:

- Increase the dose of the initial drug toward maximal levels
- Substitute an agent from another class
- Add a second drug from another class

Individualized drug selection is based on several principles:

- If the initial response to one drug is adequate, continue the same drug.
- If the response is partial on one agent, increase the dose or add a second drug of a different class.
- If there is little response, substitute another single drug from a different class.
- Consider low-dose diuretic use early or as a first addition.
- Consider loop diuretic agents instead of thiazide or thiazide-like diuretics when creatinine is greater than 2.0 mg/dL or estimated GFR less than 30 mL/min per 1.73m^2.
- Do not combine two drugs of the same class.
- The use of combination agents can be effective.

For most patients, two or more drugs in combination may be needed to reach hypertension goals. This is especially true for patients with hypertension goals focused on the low end or patients with chronic renal failure.

(Bevan, 1993; Chobanian, 2003)

Supporting evidence is of classes: A, R

9. BP at Goal?

Key Points:

- Carefully review potential barriers to long-term adherence to therapy, including the possible secondary diagnosis of depression.
- Systolic hypertension in patients aged 60 and older is an important modifiable cardiovascular risk factor.
- Accurate home monitoring systems are an important tool for assessing blood pressure control.
- Review drugs (prescription and over-the-counter) and herbal therapies that may interfere with BP goal.

If at this point acceptable response has not been achieved, several issues should be addressed or revisited. These include adherence to appropriate lifestyle modifications, consistent use of prescribed drugs, and tolerance of treatment modalities. Non-adherence rates to prescribed medications are estimated at 50% and are slightly higher for both elderly and adolescent patients. Since there is not a simple test to accurately measure adherence, there are some practical methods that can be used for all patients: asking the patient about missed doses, watching treatment response, tracking missed appointments, tracking prescription refills, asking about issues of cost, and monitoring side effects. Although patients will generally overestimate their adherence, simply asking the question will help identify up to 50% of low-adherence patients. Standardized instruction in self-blood-pressure measurement will allow assessment of "white coat" syndrome. Interfering substances that can adversely affect treatment include non-steroidal anti-inflammatory drugs, oral contraceptives, sympathomimetics, antidepressants, glucocorticoids, nasal decongestants, licorice-containing substances (e.g., chewing tobacco), cocaine, cyclosporine and erythropoietin. Intermittent use of alcohol, particularly in alcoholics who are binge drinkers, may cause difficulties with widely fluctuating blood pressures.

Non-specific symptoms such as fatigue, lightheadedness or vaguely impaired cognition may be due to an acute decline in blood pressure level and may resolve within four to six weeks while continuing the drug. Other minor drug-related symptoms unrelated to blood pressure change may also resolve in time without discontinuing the drug. Non-office-standardized blood pressure measurement is desirable to monitor blood pressure control.

The factors that lead to non-adherence are multifactorial: misunderstanding of the treatment and the reason for it, adverse reactions (or fear of them), depression, complex dosing regimens, financial constraints or simple forgetfulness. Asking open-ended/non-judgmental questions about treatment regimens can lead to a good discussion between the provider and patient about why the patient may have difficulty adhering. There are a number of recommendations that in various combinations may lead to better patient adherence. These suggestions are based on available evidence from randomized clinical trials that evaluated the usefulness of adherence interventions. To increase adherence on a long-term basis: provide education about the medication and how it fits with the treatment plan, simplify the regimen (e.g., less frequent dosing, [data shows compliance rates average with 79% with once-daily dosing, 69% with twice-daily dosing, 65% with three-times-daily dosing and 51% with four-times-daily dosing] combination medications, controlled release dosage forms), use patient adherence aids (e.g., pill boxes, alarms), offer support group sessions, send reminders for medication refills and appointments, cue medications to daily events (e.g., breakfast, bedtime), offer positive reinforcement (acknowledge the patient's efforts to adhere), monitor with regular physician follow-up, and actively involve family members and significant others. When choosing antihypertensive drugs, perference should be given to long-acting drugs that can be dosed once daily to enhance long-term compliance.

(Claxton, 2001; Haynes, 2002; McDonald, 2002; Nichols-English, 2000; Osterberg, 2005)

Supporting evidence is of classes: M, R

10. Resistant Hypertension?

A patient has resistant hypertension when blood pressure goals are not met despite compliance with a triple drug regimen that includes a diuretic. Numerous reasons may exist for an inadequate or poor response to two, three or more drugs, with volume overload due to excessive sodium intake or inadequate diuretic use being the more likely reasons. Other causes include nonadherence to therapy due to patient or health care provider issues, drug-related causes (using a nonantihypertensive drug that can raise blood pressure), unrecognized secondary hypertension, pseudohypertension or associated conditions including obesity and ethanol abuse *(Taler, 2002; Yakovlevitch, 1991)*.

The drug regimen should include a diuretic plus near maximal doses of two of the following classes of drugs:

- Beta-adrenergic-blocker or other anti-adrenergic agent
- Direct vasodilator
- Calcium channel-blocker
- ACE inhibitor
- Angiotensin receptor blocker

Several causes of resistant hypertension may be present:

- Improper BP measurement (overinflation of the cuff or using a cuff that is too small for the arm) can lead to inaccurately high readings
- Brachial arteries may be heavily calcified or arteriosclerotic and cannot be fully compressed (pseudo-hypertension)
- Clinic or white coat hypertension
- Failure to receive adequate doses of medication (may be reluctance by patient or practitioner)
- Inadequate diuretic therapy
- Drug interactions

Supporting evidence is of classes: A, D

11. Hypertension Consult

Consider hypertension consultation if a patient's blood pressure is not controlled on two medications or if secondary hypertension is suspected. All patients with BP that is not controlled on three medications should be referred for consultation.

12. Hypertension Continuing Care

Key Points:

- On follow-up visits, history and physical examination should be directed toward detection of hypertensive target organ damage.

- In patients with office BP at goal who demonstrate progressive target organ disease, home monitoring may be beneficial.

Once BP is at goal and stable, the patient should be seen usually at three- to six-month intervals by the provider to assess patient adherence, patient satisfaction and any changes in target organ status. Patients' comorbidities such as heart failure, associated diseases such as diabetes, and need for laboratory tests influence the frequency of visits. Lifestyle modifications should be reviewed, re-emphasized and documented annually. Patients should monitor blood pressure more frequently by home monitoring or by other allied health professionals.

Ongoing care can be facilitated by physicians or specially trained allied health care professionals who provide education, reinforcement, realistic short- and long-term goalsetting and adjustment of medications according to the individual clinical situation. Intervention strategies that seek to involve the patient in decision-making can improve long-term adherence to therapy and thus better blood pressure control. Additionally, such an ongoing relationship might better identify those patients who are suitable candidates for a reduction or withdrawal of antihypertensive drug therapy following a prolonged interval of excellent blood pressure control.

(Chobanian, 2003; Nelson, 2001)

On follow-up visits, history and physical examination should be directed toward detection of hypertensive target organ damage.

One may consider decreasing the dosage or number of antihypertensive drugs while maintaining lifestyle modification if:

- Patient has uncomplicated hypertension that is well controlled; and
- Blood pressure has been maintained and documented for at least one year.

Supporting evidence is of classes: M, R

Appendix A – Clinical Evaluation of Confirmed Hypertension

This table is used to help define etiology, to define target organ damage and to identify cardiovascular risk factors.

Medical History	**Pertinent Medical History in the Initial Evaluation of Hypertension:** • Symptoms suggesting secondary hypertension • History of high blood pressure, including duration and levels • Results and side effects of previous antihypertensive therapy • Use of oral contraceptives, steroids, NSAIDs, nasal decongestants, appetite suppressants, tricyclic/tetracyclic antidepressants, MAO inhibitors, cocaine and other illicit drugs, alcohol, and/or herbal supplements • History of tobacco use, diabetes, hyperlipidemia • History of weight gain, exercise, sodium and fat intake • History or symptoms of stroke, TIA, angina, previous MI, coronary revascularization procedure, heart failure, claudication, renal disease • Psychosocial and environmental factors that may influence blood pressure
Physical Examination	**Pertinent Features on Physical Examination:** • Tachycardia • Unequal blood pressures in arms (more than 10 mmHg) • Cushingoid appearance • Obesity • Orthostatic drop after standing for two minutes • Arteriolar narrowing, AV nicking, papilloedema, hemorrhages or exudates in the fundi • Thyromegaly or thyroid nodules • Carotid bruits or diminished upstroke • Cardiomegaly • Murmurs, gallops or arrythmias • Signs of heart failure • Abdominal bruits or masses • Delayed or diminished peripheral pulses • Aneurysms • Peripheral edema • Neurological deficits on exam • Radial/femoral pulse delay
Initial Pertinent Labs Order tests as necessary, especially if not done within past year. (Each institution's lab profiles may vary as to which are most costeffective and efficient.)	**Routine Labs:** • 12-lead ECG • Urinalysis • Fasting blood glucose • Hematocrit • Serum sodium • Potassium • Creatinine (estimate GFR*) • Calcium • Lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides)

*Estimate of GFR = (140 - age in years) X (weight in kilograms) X (0.85 if patient female)/72 X (serum creatinine)
GFR calculator available at http://www.hdcn.com/calcf/gfr.htm

Appendix B – Standards for Blood Pressure Measurement

Accurate, reproducible blood pressure measurement is important to correctly classify blood pressure. Inconsistencies may result from using defective equipment and not standardizing the technique. Review the following steps and the accompanying rationale. Based on surveys that show the variability of BP measurement, training sessions should be arranged by your medical facility.

These standards are consistent with AHA and NHLBI recommendations.

SELECTING EQUIPMENT:	RATIONALE:
Use mercury manometer or a recently calibrated aneroid manometer with the center of the mercury column or aneroid dial at eye level.	*If the meniscus of the Hg or aneroid gauge is not level with your vision, a reading may be read as too high or too low.*
Select appropriate cuff size. The width of the bladder should be 40% of the arm circumference and the length of the bladder should encircle at least 80% of the arm.	*A too-small cuff will give falsely high readings. A too-large cuff may rarely give a false low reading but with less clinical significance.*
Use the bell of the stethoscope. Ideally the bell should be placed above the medial epicondyle and medial to the biceps tendon (brachial artery).	*The stethoscope bell is designed to listen to low-pitched sounds. The early and late blood pressure sounds are low pitched.*

PREPARING THE PATIENT:	RATIONALE:
The patient should avoid eating, smoking, caffeine, exercise, and drinking alcohol one-half to one hour before blood pressure measurement.	*Readings will vary after exercise, eating, smoking, drinking alcohol or having caffeine (e.g. differences of 5-15 mmHg with 150 mg caffeine within 15 minutes).*
Have the patient sit quietly for a period at rest with both feet flat on the floor and back supported prior to measurement.	*Any change in posture or activity causes blood pressure to change. Some patients may experience an alerting reaction initially.*
No clothing should be between the blood pressure cuff and the arm. Place the center of the cuff's bladder over the brachial artery on the upper arm.	*Extra noise from the bell of the stethoscope rubbing against clothing could cause a false blood pressure reading. Failure to center the cuff can result in a falsely high reading.*
Use the patient's same arm for blood pressure readings and record arm and cuff size used.	*This allows for consistency and better comparison.*
The patient's arm should be supported or allowed to rest on a solid surface so the inner aspect of the bend of the elbow is level with the heart.	*The difference between lower and higher positions of the arm can cause differences in measurements of as much as 10 mmHg systolic and diastolic. For every cm the cuff sits above or below heart level, the blood pressure varies by 0.8 mmHg. If the patient's arm is tense, measurement can vary by up to 15 mmHg (systolic more than diastolic.)*

These standards are consistent with AHA and NHLBI recommendations.

TAKING AN INITIAL MEASUREMENT:	RATIONALE:
Secure the blood pressure cuff evenly and snugly around the arm, 1 to 1-1/2 inches above the antecubital space (at the elbow). Center the bladder (inflatable bag) over the brachial artery.	*A loose blood pressure cuff may balloon in the center, decreasing the effective width of the cuff. Since pressure transmitted through larger tissue bulk requires more external pressure to compress the underlying artery, a falsely higher lever of systolic and diastolic pressure may be heard.*
Initially perform a palpatory estimate of systolic pressure. Wait 15-30 seconds before taking the auscultatory reading.	*This step provides knowledge of the range of the systolic pressure. An auscultatory gap (absence of sound for 20-40 mmHg) occurs in 5% of hypertensives. The estimate will help to avoid incorrectly recording the systolic below the gap.*
Inflate the cuff quickly to 30 mmHg above the palpatory blood pressure.	*Inflating the cuff too high can cause pain and result in a falsely high reading.*
Deflate bladder at 2-3 mmHg per second.	*If the pressure is released too quickly, you could record the systolic blood pressure falsely low as the first systolic tap is missed and the diastolic is falsely high. If you deflate too slowly, you could record the diastolic falsely high.*
Record the first of at least two consecutive sounds as the systolic. Diastolic is identified by the last sound heard. If blood pressure is normal (systolic less than 140 and diastolic less than 90), inform the patient. Helpful hint: If the tones are difficult to hear, confirm brachial artery location by palpitation, then elevate arm for 15 seconds to drain the veins. With arm still overhead, inflate the cuff to 60 mmHg above palpatory blood pressure. Then lower arm and repeat auscultation.	*The last sound heard is easier than muffling for observers to accurately record. In some patients, (for example, children or pregnant women) sounds are heard to near 0. In these cases, record both muffling and 0, e.g., 150/80/0. The muffling value is then considered the diastolic pressure.*

CONFIRMING INITIAL ELEVATION:	RATIONALE:
If blood pressure is elevated and the patient had initially waited quietly for five minutes, repeat blood pressure in one-two minutes. Record both measurements and inform the patient.	*Because blood pressure normally varies up to 10 mmHg, it is necessary to take two readings to obtain the most accurate present blood pressure.*
If blood pressure is elevated but the patient had not initially waited quietly for five minutes, now allow for a five-minute rest. Remeasure blood pressure and record it as the first reading. If this blood pressure is still elevated, repeat the measurement in one-two minutes, record it as the second measurement, and inform the patient.	*A time interval of one-two minutes between cuff inflations is necessary to reduce forearm engorgement.*

This form was developed by Park Nicollet Health Services.

Appendix C – Suspicion of Secondary Hypertension

Early discussion or consultation with an appropriate subspecialist may lead to the most accurate and cost-effective workup.

Clinical Findings:	*Recommended Test/Referral:*
Elevated serum creatinine, abnormal urine sediment, hematuria on two occasions, or structural renal abnormality	Consider referral to Nephrology.
Isolated proteinuria on two occasions	24-hour urine for protein and creatinine clearance
Features of renovascular hypertension: • Initial onset before age 30 or after age 50 years • BP over 180/110 • Hemorrhages and exudates in the fundi • Presence of abdominal bruit over renal arteries • Diminishing blood pressure control • Women of child-bearing age • Sudden worsening of previously controlled hypertension • Unexplained episodes of pulmonary edema • Acute decline in renal function with ACEI or ARB • Unexplained decline in renal function	Hypertensive IVPs are not recommended. There is no single test for renovascular hypertension. Consult experts in your institution.
Low serum potassium in absence of diuretics on two occasions	Consider primary aldosteronism and referral to Nephrology or Endocrinology.
Cushingoid features	24-hour urine for cortisol
Features of pheochromocytoma: • Spells - Headaches - Palpitations - Perspiration - Pallor • Extremely labile blood pressure	Plasma metanephrines or 24-hour urine metanephrines if plasma results not available

Appendix D – 10-Year CVD Risk Calculator (Risk Assessment)

Table 1.

	Points				
Age	**20-39**	**40-49**	**50-59**	**60-69**	**70-79**
Nonsmoker	0	0	0	0	0
Smoker-Male	8	5	3	1	1
Smoker-Female	9	7	4	2	1

Table 2.

Points				
Systolic BP	**Untreated**		**Treated**	
	Male	**Female**	**Male**	**Female**
< 120	0	0	0	0
120-129	0	1	1	3
130-139	1	2	2	4
140-159	1	3	2	5
≥ 160	2	4	3	6

Table 3.

HDL	Points
≥ 60	-1
50-59	0
40-49	1
< 40	2

Table 4.

	Points	
Age	**Male**	**Female**
20-34	-9	-7
35-39	-4	-3
40-44	0	0
45-49	3	3
50-54	6	6
55-59	8	8
60-64	10	10
65-69	11	12
70-74	12	14
75-79	13	16

Table 5.

Points										
Age	**20-39**		**40-49**		**50-59**		**60-69**		**70-79**	
Total Cholesterol	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
< 160	0	0	0	0	0	0	0	0	0	0
160-199	4	4	3	3	2	2	1	1	0	1
200-239	7	8	5	6	3	4	1	2	0	1
240-279	9	11	6	8	4	5	2	3	1	2
> 280	11	13	8	10	5	7	3	4	1	2

Table 6.

Table 1+2+3+4+5	10-Year Risk %	
Point Total	**Male**	**Female**
< 0	< 1	< 1
0	1	< 1
1	1	< 1
2	1	< 1
3	1	< 1
4	1	< 1
5	2	< 1
6	2	< 1
7	3	< 1
8	4	< 1
9	5	1
10	6	1
11	8	1
12	**10**	1
13	**12**	2
14	**16**	2
15	*20*	3
16	*25*	4
17	*> 30*	5
18	*> 30*	6
19	*> 30*	8
20	*> 30*	11
21	*> 30*	14
22	*> 30*	17
23	*> 30*	22
24	*> 30*	27
> 25	*> 30*	> 30

There is an "on-line" and a palm format downloadable CV risk calculator that is used in assessing 10-year risk of CV disease used in the ATP III report and this guideline on lipid management. The links are:
On-line calculator: **http://hin.nhlbi.nih.gov/atpiii/calculator.asp?usertype=prof**
Palm format (downloadable): **http://hin.nhlbi.nih.gov/atpii/riskcalc.htm**

Appendix E – Recommended Education Messages

Purpose

The following educational messages will support the goals of patient education and self-involvement in ongoing hypertension management:

Health Care Provider Visits

Basic Information

- Discuss:
  - What is blood pressure?
  - What do the numbers mean?
  - Factors affecting blood pressure, e.g., OTC. meds.
  - How HBP affects health.

Lifestyle Modification

- Recommend appropriate lifestyle modification:
  - Weight reduction and maintenance
  - Moderation of dietary sodium
  - Moderation of alcohol intake
  - Adequate physical activity
  - Incorporation of DASH diet
- Recommend interventions for cardiovascular risk factors (e.g., smoking, hyperlipidemia, diabetes).

Pharmacologic Therapy

- Reinforce lifestyle modification and cardiovascular risk factor interventions.
- Provide medication information (i.e., what, when, and why taking medication, possible side effects).
- Advise when to call with problems.

Ongoing Management

- Advise on necessity for follow-up.
- Set realistic goals in partnership with the patient.
- Reinforce educational messages.
- Adopt an attitude of concern along with hope and interest in the patient's future.
- Provide positive feedback for BP and behavioral improvement.

* Resource: "Hypertension = High Blood Pressure," a patient education brochure developed by Hypertension Screening guideline team (See educational resource list)

Appendix F – Therapies

Drug	Associated Conditions Where Indicated	Associated Conditions Where Useful	Associated Conditions Requiring Caution	Contraindications	Drug Interactions*	Potential Side Effects*
Thiazide Diuretics • preferred initial therapy for most patients with uncomplicated hypertension • especially effective in African Americans	- ISH in elderly - heart failure - diabetes - high coronary risk	- edema states - renal insufficiency (loop agents for CR > 2.0 mg/dl)	- cardiac arrythmias - glucose intolerance - elevated triglycerides - gout - hypertrophic cardiomyopathy	- sensitivity to thiazides	- increase lithium blood levels - action blocked by NSAIDs - hypokalemia enhances digoxin toxicity - ACE inhibitors lessen hypokalemia	- hypokalemia - hyperuricemia - hyponatremia - hyperglycemia - dizziness - fatigue - erectile dysfunction - dry mouth - nausea - constipation - orthostatic hypotension - rash
Beta-Blockers	- previous MI (non-ISA)* - heart failure - diabetes - high coronary risk	- angina pectoris - supraventricular arrythmias - suppression of PVCs - prophylaxis for migraines - hypertrophic cardiomyopathy - anxiety - essential tremor - glaucoma	- COPD with mild bronchospasm** - rhinitis - variant angina - Raynaud's disease - peripheral vascular disease - hyperlipidemia - pheochromocytoma - depression - mild asthma**	- asthma (moderate or severe) - COPD with significant bronchospasm - sinus bradycardia (non-ISA) - 2nd or 3rd degree heart block - sensitivity to beta-blockers - hypoglycemia-prone IDDM	- cimetidine and nicotine reduce bioavailability of liver-metabolized drugs - liver-metabolized beta-blockers may increase warfarin activity - additive negative inotropic effect with verapamil - addition of reserpine - bradycardia and syncope - combined with verapamil may cause complete heart block	- erectile dysfunction - fatigue - lightheadedness - dizziness - dyspnea - wheezing - cold extremities - claudication - confusion - vivid dreams - insomnia - depression - diarrhea - bradycardia

* ISA = Intrinsic Sympathomimetic Activity (acebutolol, penbutolol, pindolol)
** Use cardioselective agents

Drug	Associated Conditions Where Indicated	Associated Conditions Where Useful	Associated Conditions Requiring Caution	Contraindications	Drug Interactions*	Potential Side Effects*
ACE Inhibitors	- type 1 diabetes with renal disease - congestive heart failure - previous MI with impaired LV function - non-diabetic renal diseases associated with proteinuria - high coronary risk	- nephrotic syndrome - unilateral renovascular hypertension - type 2 diabetes with renal disease	- renal insufficiency (renal function and hyperkalemia) - bilateral renal artery stenosis - renal artery stenosis in solitary kidney - hypertrophic cardiomyopathy - less effective for monotherapy in African Americans	- pregnancy† - sensitivity to ACE inhibitors	- antihypertensive effect blocked by NSAIDs - NSAIDs (hyperkalemia) - potassium supplements (hyperkalemia) - potassium sparing diuretics (less hypokalemia or hyperkalemia)	- angioedema - cough - tachycardia - increase in serum creatinine - increase in serum potassium - nausea - hypotension - diarrhea - fatigue - taste disorders (rare) - agranulocytosis (rare)
Calcium Channel Blockers	- ISH in elderly patients 60 (long acting dihydropyiridines) - diabetes - high coronary risk	- angina pectoris - variant angina pectoris - migraine prophylaxis (verapamil) - Raynaud's disease (nifedipine) - esophageal spasm - hypertrophic cardiomyopathy without obstruction (verapamil, diltiazem) - supraventricular tachycardia (verapamil) - pulmonary hypertension (nifedipine)	- mild heart failure (verapamil > diltiazem > dihydropyiridines) - liver disease - high risk for heart failure	- severe heart failure (verapamil) - 2nd or 3rd degree heart block - sick sinus syndrome (verapamil, diltiazem) - Wolf-Parkinson-White syndrome (verapamil) - previous MI with heart failure (diltiazem) - sensitivity to calcium channel blockers	- additive negative inotropic effect with beta-blockers (verapamil) - verapamil increases digoxin blood levels - cimetidine increases nifedipine blood levels	- dizziness - peripheral edema - headache - flushing - constipation (verapamil) - heart block (verapamil) - rash - abnormal live enzymes - hypotension

* For a complete listing of side effects and drug interactions for any particular drug, consult the PDR or academic pharmacology texts.
† Cooper, 2006

Appendix F – Therapies

Drug	Associated Conditions Where Indicated	Associated Conditions Where Useful	Associated Conditions Requiring Caution	Contraindications	Drug Interactions*	Potential Side Effects*
Angiotensin Receptor Blockers	- type 2 diabetes with renal disease - non-diabetic renal disease with proteinuria - heart failure - left ventricular hypertrophy	- congestive heart failure - type 1 diabetes with renal involvement - nephrotic syndrome - unilateral renovascular hypertension	- renal insufficiency (renal function and hyperkalemia) - bilateral renal artery stenosis - renal artery stenosis in solitary kidney - hypertrophic cardiomyopathy	- pregnancy - sensitivity to angiotensin receptor blockers	- antihypertensive effect blocked by NSAIDs - NSAIDs (hyperkalemia) - potassium supplements (hyperkalemia) - potassium sparing diuretics (less hypokalemia or hyperkalemia)	- angioedema - tachycardia - increase in serum creatinine - increase in serum potassium - hypotension - fatigue

* For a complete listing of side effects and drug, interactions for any particular drug, consult the PDR or academic pharmacology texts.

Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension* 2003;42:1206-52. (Class R)

Supporting evidence is of class: R

Appendix G – Cost of Antihypertensive Drugs

Approximate cost to the patient for a 30-day supply. Based on medication formulary issues for each health plan and pharmacy, these costs may vary. Treatment with the lowest dose tablet or capsule from retail pharmacies nationwide.

Diuretics

Drug	Formulations	Cost
Thiazide-Type		
Chlorothiazide – generic	250, 500 mg tablets	$
Diuril	250, 500 mg tablets	$
Hydrochlorothiazide – generic	12.5 mg capsules	$
	25, 20 mg tablets	$
Microzide	12.5 mg capsules	$$
Chlorthalidone – generic	25, 50, 100 mg tablets	$
Thalitone	15 mg tablets	$$$
Indapamide – generic	1.25, 2.5 mg tablets	$$
Lozol	1.25, 2.5 mg tablets	$$
Zaroxolyn	2.5, 5, 10 mg tablets	$$$
Mykrox	0.5 mg tablets	$$$
Loop		
Bumetanide – generic	0.5, 1, 2 mg tablets	$
Bumex	0.5, 1, 2 mg tablets	$$
Ethacrynic acid – *Edecrin*	25, 50 mg tablets	$
Furosemide – generic	20, 40, 80 mg tablets	$
Lasix	20, 40, 80 mg tablets	$
Torsemide – generic	5, 10, 20, 100 mg tablets	$$
Demadex	5, 10, 20, 100 mg tablets	$$$
Potassium-Sparing		
Amiloride – generic	5 mg tablets	$$
Midamor	5 mg tablets	$$
Eplerenone – *Inspra*	25, 50 mg tablets	$$$$$
Spironolactone – generic	25, 50, 100 mg tablets	$
Aldactone	25, 50, 100 mg tablets	$$
Triamterene – *Dyrenium*	50, 100 mg capsules	$$

$0-10 = $
$11-30 = $$
$31-50 = $$$
$51-70 = $$$$
Greater than $71 = $$$$$

* For information on cost impact of hypertension drug selection, see Fischer, 2006.

Angiotensin-Converting Enzyme Inhibitors (ACEs)

Drug	Formulations	Cost
Benazepril – generic	5, 10, 20, 40 mg tablets	$$$
Lotensin	5, 10, 20, 40 mg tablets	$$$
Captopril – generic	12.5, 25, 50, 100 mg tablets	$$$
Capoten	12.5, 25, 50, 100 mg tablets	$$$$
Enalapril – generic	2.5, 5, 10, 20 mg tablets	$$
Vasotec	2.5, 5, 10, 20 mg tablets	$$$
Fosinopril – generic	10, 20, 40 mg tablets	$$$
Monopril	10, 20, 40 mg tablets	$$$
Lisinopril – generic	2.5, 5, 10, 20, 30, 40 mg tablets	$$
Prinivil/Zestril	2.5, 5, 10, 20, 30, 40 mg tablets	$$$-$$$$
Moexipril – generic	7.5, 15 mg tablets	$$$
Univasc	7.5, 15 mg tablets	$$$
Perindopril - *Aceon*	2, 4, 8 mg tablets	$$$-$$$$
Quinapril – *Accupril*	5, 10, 20, 40 mg tablets	$$$
Ramipril – *Altace*	1.25, 2.5, 5, 10, mg capsules	$$$
Trandolapril – *Mavik*	1, 2, 4 mg tablets	$$$

Angiotensin Receptor Blockers (ARBs)

Drug	Formulations	Cost
Candesartan – *Atacand*	4, 8, 16, 32 mg tablets	$$$
Eprosartan – *Teveten*	400, 600 mg tablets	$$$
Irbesartan – *Avapro*	75, 150, 300 mg tablets	$$$
Losartan – *Cozaar*	25, 50, 100 mg tablets	$$$
Olmesartan – *Benicar*	5, 20, 40 mg tablets	$$$
Telmisartan – *Micardis*	20, 40, 80 mg tablets	$$$
Valsartan – *Diovan*	40, 80, 160, 320 mg tablets	$$$

$0-10 = $
$11-30 = $$
$31-50 = $$$
$51-70 = $$$$
Greater than $71 = $$$$$

Beta-Adrenergic Blockers

Drug	Formulations	Cost
Atenolol – generic	25, 50, 100 mg tablets	$$
Tenormin	25, 50, 100 mg tablets	$$$
Betaxolol – generic	10, 20 mg tablets	$$
Kerlone	10, 20 mg tablets	$$$
Bisoprolol – generic	5, 10 mg tablets	$$
Zebeta		$$$
Metoprolol – generic	25, 50, 100 mg tablets	$$
Lopressor extended-release	50, 100 mg tablets	$$$
Toprol-XL	25, 50, 100, 200 mg ER tablets	$$
Nadolol – generic	20, 40, 80, 120, 160 mg tablets	$$
Corgard	20, 40, 80, 120, 160 mg tablets	$$$$
Propranolol – generic	10, 20, 40, 60, 80 tablets	$$
Inderal extended-release generic	60, 80, 120, 160 mg ER capsules 60, 80, 120, 160 mg ER capsules	$$$
Inderal-LA	60, 80, 120, 160 mg ER capsules	$$$
InnoPran XL	80, 120 mg ER capsules	$$$
Timolol – generic	5, 10, 20, mg tablets	$$
Blocadren	5, 10, 20, mg tablets	$$$
Beta-Blockers with Intrinsic Sympathomimetic Activity		
Acebutolol – generic	200, 400 mg capsules	$$
Sectral	200, 400 mg capsules	$$$$$
Carteolol – *Cartrol*	2.5, 5 mg tablets	$$$
Penbutolol – *Levatol*	20 mg tablets	$$$$
Pindolol – generic	5, 10 mg tablets	$$$
Beta-Blockers with Alpha Blocking Activity		
Carvedilol – *Coreg*	3.125, 6.25, 12.5, 25 mg tablets	$$$$$
Labetalol – generic	100, 200, 300 mg tablets	$$
Normodyne	100, 200, 300 mg tablets	$$$
Trandate	100, 200, 300 mg tablets	$$$

$0-10 = $
$11-30 = $$
$31-50 = $$$
$51-70 = $$$$
Greater than $71 = $$$$$

Calcium-Channel Blockers

Drug	Formulations	Cost
Diltiazem –		
ext-release (twice/d) generic	60, 90, 120, 180, 240, 300 mg ER capsules	$$$
ext-release (once/d) generic	120, 180, 240 mg ER capsules	$$
Cardizem CD	120, 180, 240, 300, 360 mg ER capsules	$$$
Cardizem LA	120, 180, 240, 300, 360, 420 mg ER tablets	$$$
Cartia XT	120, 180, 240, 300 mg ER capsules	$$
Dilacor XR	120, 180, 240 mg ER capsules	$$$
Diltia XT	120, 180, 240 mg ER capsules	$$
Tiazac	120, 180, 240, 300, 360, 420 mg ER capsules	$$$
Verapamil – generic	40, 80, 120 mg tablets	$$
Calan extended release		$$$
generic (tabs)	120, 180, 240 mg ER tablets	$$
generic (caps)	120, 180, 240 mg ER capsules	$$$
Calan SR	120, 180, 240 mg ER tablets	$$$
Isoptin SR ext-release (once/d)	120, 180, 240 mg ER tablets	$$$
Covera-HS	180, 240 mg ER tablets	$$$
Verelan	120, 180, 240, 360 mg ER capsules	$$$$
Verelan PM	100, 200, 300 mg ER capsules	$$$
Dihydropyridines		
Amlodipine – *Norvasc*	2.5, 5, 10 mg tablets	$$$$
Felodipine – generic	2.5, 5, 10 mg ER tablets	$$$
Plendil	2.5, 5, 10 mg ER tablets	$$$
Isradipine – *DynaCirc* extended-release	2.5, 5 mg capsules	$$$$$
DynaCirc CR	5, 10 mg ER tablets	$$$$
Nicardipine – generic	20, 30 mg capsules	$$
Cardene extended-release	20, 30 mg capsules	$$$
Cardene SR	30, 45, 60 mg ER capsules	$$$$$
Nifedipine – ext-release generic	30, 60, 90 mg ER tablets	$$
Adalat	30, 60, 90 mg ER tablets	$$$
Procardia	30, 60, 90 mg ER tablets	$$$
Nisoldipine – *Sular*	10, 20, 30, 40 mg ER tablets	$$$

$0-10 = $
$11-30 = $$
$31-50 = $$$
$51-70 = $$$$
Greater than $71 = $$$$$

Alpha-Adrenergic Blockers

Drug	Formulations	Cost
Prazosin – generic	1, 2, 5 mg capsules	$
Minipress	1, 2, 5 mg capsules	$$
Terazosin – generic	1, 2, 5, 10 mg capsules	$$$
Hytrin	1, 2, 5, 10 mg capsules	$$$$
Doxazosin – generic	1, 2, 4, 8 mg tablets	$$
Cardura	1, 2, 4, 8 mg tablets	$$$

Other Antihypertensives

Drug	Formulations	Cost
Central Alpha-Andrenergic Agonists		
Clonidine – generic	0.1, 0.2, 0.3 mg tablets	$
Catapres		$$
Catapres TTS (transdermal)	0.1, 0.2, 0.3 mg patches	$$$$
Guanabenz – generic	4, 8 mg tablets	$$
Guanfacine – generic	1, 2 mg tablets	$$
Tenex		$$$$$
Methyldopa – generic	250, 500 mg tablets	$
Aldomet	125, 250, 500 mg tablets	$$
Direct Vasodilators		
Hydralazine – generic	10, 25, 50, 100 mg tablets	$$
Apresoline	25, 50 mg tablets	$$
Minoxidil – generic	2.5, 10 mg tablets	$$
Peripheral Adrenergic Neuron Antagonists		
Guanadrel	10 mg tablets	$$$$
Resperine – generic	0.1, 0.25 mg tablets	$

$0-10 = $
$11-30 = $$
$31-50 = $$$
$51-70 = $$$$
Greater than $71 = $$$$$

Some Combination Products

Drug	Cost
Ace Inhibitors and Diuretics	
Benazepril 5, 10, 20 mg/hydrochlorothiazide 6.25, 12.5 or 25 mg generic	$$
Lotensin HCT	$$$
Captopril 25 or 50 mg/hydrochlorothiazide 15 or 25 mg generic	$$
Capozide	$$$
Enalapril 5 or 10 mg/hydrochlorothiazide 12.5 or 25 mg generic	$$
Vaseretic	$$$
Fosinopril 10 or 20 mg/hydrochlorothiazide 12.5 mg generic	$$$
Monopril HCT	$$$
Lisinopril 10 or 20 mg/hydrochlorothiazide 12.5 or 25 mg generic	$$
Prinzide	$$$
Zestoretic	$$$
Moexipril 7.5 or 15 mg/hydrochlorothiazide 12.5 or 25 mg *Uniretic*	$$$
Quinapril 10 or 20 mg/hydrochlorothiazide 12.5 or 25 mg *Accuretic*	$$$
Angiotensin Receptor Blockers and Diuretics	
Candesartan 16 or 32 mg/hydrochlorothiazide 12.5 mg *Acacand HCT*	$$$$
Eprosartan 600 mg/hydrochlorothiazide 12.5 or 25 mg *Teveten HCT*	$$$$
Irbesartan 150 or 300 mg/ hydrochlorothiazide 12.5 mg *Avalide*	$$$$
Losartan 50 or 100 mg/hydrochlorothiazide 12.5 or 25 mg *Hyzaar*	$$$$
Olmesarten 20 or 40 mg/hydrochlorothiazide 12.5 or 25 mg *Benicar HCT*	$$$$
Telmisartan 40 or 80 mg/hydrochlorothiazide 12.5 mg *Micardia HCT*	$$$$
Valsartan 80 or 160 mg/hydrochlorothiazide 12.5 or 25 mg *Diovan HCT*	$$$$
Beta-Andrenergic Blockers and Diuretics	
Atenolol 50 or 100 mg/chlorthialidone 25 mg generic	$$
Tenoretic	$$$
Bisoprolol 2.5, 5 or 10 mg/hydrochlorothiazide 6.25 mg generic	$$
Ziac	$$$$
Metoprolol 50 or 100 mg/hydrochlorothiazide 25 or 50 mg generic	$$
Lopressor HCT	$$$
Propranolol 40 or 80 mg/hydrochlorothiazide 25 mg generic	$
Propranolol extended-release 80, 120 or 160 mg/hydrochlorothiazide 50 mg	
Inderide LA	$$$$
Timolol 10 mg/hydrochlorothiazide 25 mg	
Timolide	$$
Diuretic Combinations	
Hydrochlorothiazide 25 or 50 mg/spironolactone 25 or 50 mg generic	$$
Aldactazide	$$
Hydrochlorothiazide 25 or 50 mg/triamterene 37.5, 50 or 75 mg generic	$
Dyazide	$$
Maxzide	$$
Hydrochlorothiazide 50 mg/amiloride 5 mg generic	$
Moduretic	$$
Direct Vasodilators and Diuretics	
Hydralazine 25 or 50 mg/hydrochlorothiazide 25 or 50 mg generic	$
Central Alpha/Andrenergic Agonist and Diuretics	
Methyldopa 250 mg/hydrochlorothiazide 15, 25 mg generic	$$
Aldoril	$$$
Clonidine 0.1, 0.2 or 0.3 mg/hydrochlorothiazide 15 mg generic	$$$
Calcium-Channel Blockers and Ace Inhibitors	
Amiodipine 2.5 or 5 mg/benazepril 10 or 20 mg *Lotrel*	$$$$
Felodipine 2.5 or 5 mg/enalapril 5 mg *Lexxel*	$$$$
Verapamil extended-release 180 or 240 mg/trandolapril 1, 2 or 4 mg *Tarka*	$$$$

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Evidence Grading System

I. CLASSES OF RESEARCH REPORTS

A. Primary Reports of New Data Collection:

Class A: Randomized, controlled trial

Class B: Cohort study

Class C: Non-randomized trial with concurrent or historical controls
Case-control study
Study of sensitivity and specificity of a diagnostic test
Population-based descriptive study

Class D: Cross-sectional study
Case series
Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M: Meta-analysis
Systematic review
Decision analysis
Cost-effectiveness analysis

Class R: Consensus statement
Consensus report
Narrative review

Class X: Medical opinion

II. CONCLUSION GRADES

Key conclusions (as determined by the work group) are supported by a conclusion grading worksheet that summarizes the important studies pertaining to the conclusion. Individual studies are classed according to the system defined in Section I, above, and are assigned a designator of +, -, or ø to reflect the study quality. Conclusion grades are determined by the work group based on the following definitions:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results from different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

The symbols **+**, **–**, **ø**, and **N/A** found on the conclusion grading worksheets are used to designate the quality of the primary research reports and systematic reviews:

+ indicates that the report or review has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis;

– indicates that these issues have not been adequately addressed;

ø indicates that the report or review is neither exceptionally strong or exceptionally weak;

N/A indicates that the report is not a primary reference or a systematic review and therefore the quality has not been assessed.

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Conclusion Grading Worksheet A – Annotation #7 (Isolated Systolic Hypertension)

Work Group's Conclusion: Systolic hypertension in patients age 60 and older is an important modifiable cardiovascular risk factor.

Conclusion Grade: I

Work Group's Conclusion: Drug treatment for Stage 1 (SBP 140-159 mm Hg) systolic hypertension in patients age 60 and older is effective in reducing cardiovascular disease morbidity and mortality.

Conclusion Grade: III

Work Group's Conclusion: Drug treatment for Stage 2 (SBP ≥ 160-180 mm Hg) systolic hypertension in patients age 60 and older is effective in reducing cardiovascular disease morbidity and mortality.

Conclusion Grade: I

Author/Year	Design Type	Class	Quality +, –, ø	Population Studied/Sample Size	Primary Outcome Measure(s)/Results (e.g., p-value, confidence interval, relative risk, odds ratio, likelihood ratio, number needed to treat)	Authors' Conclusions/ *Work Group's Comments (italicized)*
Haider et al., 2003	Cohort	B	ø	-2040 free-living Framingham Heart Study participants -mean age 61 years (range 50-79) -894 men and 1146 women -results adjusted for age, sex, smoking, left ventricular hypertrophy, BMI, diabetes, HDL, and heart rate	-CHF developed in 234 (11%) patients -20 mm Hg increment in systolic blood pressure (SBP) indicated a 56% increased risk for CHF (hazard ratio 1.56, 95%CI 1.37-1.77) -16 mm Hg increment in pulse pressure (PP) indicated a 55% increased risk for CHF (hazard ratio 1.55, 95%CI 1.37-1.75) -for patients with systolic hypertension at baseline (140 mm Hg or higher), increased risks of CHF were 41% (SBP: hazard ratio 1.41, 95%CI 1.18-1.69) and 42% (PP: 1.42, 1.14-1.76)	-Although each component of BP was associated with risk for CHF, pulse and systolic pressure conferred greater risk than diastolic pressure.
Kostis et al., 1997 Somes et al., 1999 (SHEP Trial)	RCT	A	ø	-4736 patients age 60 or older with SBP from 160-219 mm Hg and DBP below 90mm Hg -randomized to receive chlorthalidone (12.5-25mg) followed by atenolol (25-50mg) or placebo -average follow-up 4.5 years	-heart failure (fatal or non-fatal) occurred in 55 active trx patients and 105 placebo patients (RR 0.51; p<0.001, 95%CI 0.37-0.71) -number needed to treat to prevent 1 event (NNT) is 48 -among patients with prior MI, RR=0.19 (p=0.002, 95%CI 0.06-0.53; NNT 15) -after adjustment for race, sex, prior use of meds, composite variable (diabetes, previous heart attack, stroke), age, smoking, SPB, active trx group found a decrease in 5 mm Hg in DBP increased risk for stroke (RR 1.14; 95% CI 1.05-1.22), CHD (1.08, 1.00-116), and CVD (1.11, 1.05-1.16)	-In older persons with isolated systolic hypertension, stepped-care treatment based on low-dose chlorthalidone exerted a strong protective effect in preventing heart failure. -Some patients with ISH may be treated to a level that uncovers subclinical disease, and some may be overrated.

Author/Year	Design Type	Class	Quality +,−,**ø**	Population Studied/Sample Size	Primary Outcome Measure(s)/Results (e.g., p-value, confidence interval, relative risk, odds ratio, likelihood ratio, number needed to treat)	Authors' Conclusions/ *Work Group's Comments (italicized)*
Staessen et al., 1997 Forrette et al., 1998 (Syst-Eur Trial)	RCT	A	**ø**	-4695 patients age 60 or older with SBP from 160-219 mm Hg and DBP below 95mm Hg -randomized to receive nitrendipine (10-40mg/day) with possible addition of enalapril (25-50mg), and hydrochlorathiazide (12.5-25mg) or matching placebos -median follow-up 2 years -cognitive function assessed by mini mental state examination	-systolic and diastolic BP fell by 13 and 2 mm Hg in placebo group and 23 and 7 mm Hg in trx group, respectively; between group differences were systolic 10.1 mm Hg (95%CI 8.8-11.4) and diastolic 4.5 mm Hg (3.9-5.1) -trx reduced strokes by 42% (p=0.003) and all fatal and non-fatal cardiovascular endpoints by 31% (p<0.001) -trx reduced dementia incidence by 50% (21 vs 11 patients, p=0.05) -at last assessment, SBP and DBP reduced by 8.3 and 3.8 mm Hg in trx group (p<0.001)	-In elderly people with isolated systolic hypertension, antihypertensive treatment reduced the rate of cardiovascular complications. -Treatment was also associated with a lower incidence of dementia.
Staessen et al., 2001	Meta-Analysis	M	**ø**	-15,693 patients from 8 trials were included in analysis -patients age 60 or older with SBP from 160mm Hg or greater and DBP below 95mm Hg -median follow-up 3.8 years -results adjusted for age, sex, DBP, and dilution bias	-a 10mm Hg higher initial SBP was associated with relative hazard ratios of 1.26 total mortality (p=0.0001), 1.22 stroke (p=0.02), and coronary events 1.07 (p=0.37) -active trx reduced total mortality by 13% (p=0.02, 95% CI 2-22), cardiovascular mortality by 18% (p=0.01, 95% CI 4-29), all cardiovascular complications by 26% (p<0.0001, 95% CI 17-34), stroke by 30% (p<0.0001, 95% CI 18-41), and coronary events by 23% (p=0.001, 95% CI 10-31)	-Drug treatment is justified in older patients with isolated systolic hypertension whose SBP is 160 mm Hg or higher.
Kannel et al., 2000	Review	R	**N/A**	-review of studies of systolic blood pressure and hypertension including the Framingham Heart Study (FHS)	-from FHS, subjects with systolic hypertension, DBP was only weakly related to the risk of cardiovascular events; subjects with diastolic hypertension, risk of cardiovascular events was strongly influenced by level of systolic pressure -cardiovascular event rates increase steeply with SBP and higher in cases of ISH than diastolic hypertension -clinical trials produced similar results	-The health community needs to be re-educated to consider the importance of systolic and diastolic BP in assessing appropriate management strategies for hypertensive patients.

This section provides resources, strategies and measurement specifications for use in closing the gap between current clinical practice and the recommendations set forth in the guideline.

The subdivisions of this section are:

- Priority Aims and Suggested Measures
  - Measurement Specifications
- Knowledge Products and Resources
- Other Resources Available

Priority Aims and Suggested Measures

1. Increase the percentage of patients in blood pressure control.

   Possible measures of accomplishing this aim:

   a. Percentage of patients who have blood pressure less than 140/90 mmHg at the clinic visit.

   b. Percentage of patients above 60 years old who have blood pressure less than 160/90 mmHg at the clinic visit.

   c. Percentage of patients with diabetes, heart failure, coronary artery disese (CAD), or chronic kidney disease (CKD) who have blood pressure less than 130/80 mmHg at the clinic visit.

2. Improve the assessment of patients with hypertension.

   Possible measures of accomplishing this aim:

   a. Percentage of paramedical staff with documented initial and annual education in the correct technique for blood pressure measurement.

   b. Percentage of patients with home blood pressure monitoring device with documented initial education by staff in the correct technique for blood pressure measurement.

3. Increase the percentage of patients not at blood pressure goal who have a change in subsequent therapy.

   Possible measures of accomplishing this aim:

   a. Percentage of patients on medication and not at blood pressure goal with a documented change in therapy (e.g., increase in dose of initial drug, change to a drug from another class or addition of a second drug from another class).

   b. Percentage of patients with three consecutive elevated blood pressure measures who have a change in blood pressure medication started within three months.

4. Increase the percentage of patients with hypertension who receive patient education, especially in the use of non-pharmacological treatments.

   Possible measures of accomplishing this aim:

   a. Percentage of patients presenting in clinic within the last month for whom patient education about modifiable risk factors has been documented in the medical record.

   b. Percentage of patients presenting in clinic within the last month reporting a discussion about modifiable risk factors (patient survey).

Measurement Specifications

Possible Success Measure #1a

Percentage of patients who have blood pressure less than 140/90 mmHg at the clinic visit.

Data of Interest

$$\frac{\text{\# of patients with a diagnosis of hypertension who had a blood pressure reading at their last visit less than 140 mmHg systolic and less than 90 mmHg diastolic}}{\text{\# of patients age 18-60 that have a diagnosis of hypertension}}$$

Population Definition

Patients between the ages of 18 and 60 who have had an office visit within the previous 12 months having primary, secondary or tertiary ICD-9 codes 401.0, 401.1 and/or 401.9.

Method of Data Collection

Medical groups may generate a list of patients meeting the inclusion criteria. This list would be newly created not less than every 6 to 12 months to remain current. Data may be collected by medical record review. Identify the blood pressure at the most recent office visit.

Calculate the average of two or more SBP and DBP readings taken at the most recent office visit to determine level of control. Go to the previous office visit if the most recent office visit was for sigmoidoscopy, injuries, or a visit at which local anesthesia such as lidocaine was given for a procedure. The mean of two or more systolic and the mean of two or more diastolic readings taken at the selected visit would be calculated. The mean SBP and mean DBP may then be used to determine whether the patient has a blood pressure less than 140/90 mmHg.

After review in one month, all eligible patients would return to the pool of eligible patients from which the following month's sample of charts would be randomly drawn.

Time Frame for Data Collection

Randomly selected cases may be reviewed monthly.

Notes

Blood pressure should be less than 140 mmHg systolic and less than 90 mmHg diastolic while concurrently controlling other modifiable cardiovascular risk factors. These levels were achieved in the major clinical trials that demonstrated efficacy in treating Stage 1 and Stage 2 hypertension. Further reduction to a goal of 130/80 mmHg or lower is reasonable, especially in individuals with chronic kidney disease (CKD), heart failure or diabetes to preserve renal function and maximally protect against vascular complications.

In patients above 60 years of age, isolated systolic hypertension should be controlled to less than 160 mmHg. A goal of 140 mmHg is ideal.

Medical groups may use this same approach to measurement in collecting data for suggested measures b and c:

b. patients over 60 years old with a blood pressure less than 160/90 mmHg

c. patients with diabetes, heart failure, CAD or chronic kidney disease (CKD) with a blood pressure less than 130/80 mmHg

The population of patients included in the sample and the blood pressure level would be adjusted based on the patient's age (above 60 years, less than 160/90 mmHg) or underlying disease (diabetes, heart failure, CAD or chronic kidney disease [CKD], less than 130/80 mmHg).

Possible Success Measure #4a

Percentage of patients with hypertension presenting in clinic within the last month for whom patient education about modifiable risk factors has been documented in the medical record.

Population Definition

Patients age 18 and over who have had a clinic visit within the past month having primary, secondary or tertiary ICD-9 codes 401.0, 401.1 and/or 401.9.

Data of Interest

$$\frac{\text{\# of records with documentation of discussion of modifiable risk factors}}{\text{Total \# of patients with hypertension whose medical records are reviewed}}$$

Numerator/Denominator Definitions:

Numerator: Hypertension is defined as ICD-9 codes of 401.0, 401.1 and/or 401.9. Documented is defined as any evidence in the medical record that a clinician discussed modifiable risk factors that include weight reduction and maintenance, moderation of dietary sodium, moderation of alcohol intake, adequate physical activity, the DASH diet, tobacco avoidance and drug therapy.

Denominator: Hypertension is defined as ICD-9 codes of 401.0, 401.1 and/or 401.9.

Method of Data Collection

Medical groups may generate a list of patients meeting the inclusion criteria. This list would be newly created not less than every 6-12 months to remain current. Data may be collected by medical record review. Determine the presence of documentation of a discussion about modifiable risk factors at the clinic visit within the past month.

Time Frame for Data Collection

Randomly selected cases may be reviewed monthly.

Notes

Clinical studies show that the blood-pressure-lowering effects of lifestyle modifications can be equivalent to drug monotherapy. Behavior change strategies should include nutrition, exercise and smoking cessation services. Some patient education should occur and be documented at every visit.

Knowledge Products and Resources

Criteria for Selecting Resources

The following resources were selected by the Hypertension Diagnosis and Treatment guideline work group as additional resources for providers and/or patients. The following criteria were considered in selecting these resources.

- The site contains information specific to the topic of the guideline.
- The content is supported by evidence-based research.
- The content includes the source/author, and contact information.
- The content clearly states revision dates or the date the information was published.
- The content is clear about potential biases, noting conflict of interest and/or disclaimers as appropriate.

Resources Available to ICSI Members Only

The following materials are available to ICSI members only. Also available is a wide variety of other knowledge products including tool kits on CQI processes and Rapid Cycling that can be helpful. To obtain copies of these or other Knowledge Products, go to http://www.icsi.org/knowledge.

To access these materials on the Web site you must be logged in as an ICSI member.

Educational Resources

Guideline impact studies

- External Commissioned Reports: Guideline Impact Study: Treatment of Hypertension

Process Improvement Reports (PIRs)

- PIR #17 Patient Registries for Diabetes: Three Medical Groups' Experiences

Books

- Hypertension, Understanding brochure (by Park Nicollet Health Services 7/03)

ICSI has a wide varity of other knowledge products including tool kits on CQI processes and Rapid Cycling that can be helpful. To obtain copies of these or other Knowledge Products, go to http://www.icsi.org/knowledge.

Many of the materials listed in the Knowledge Products resource are only available to ICSI members.

Other Resources Available

Title/Description	Audience	Author/Organization	Web sites/Order Information
Web site with excellent resources for patient education and general heart health resources. Understanding and Controlling Your High Blood Pressure and Exercise and Your Heart	Patients and Families	American Heart Association (AHA)	http://www.americanheart.org
What You Should Know about High Blood Pressure (hypertension brochure) #31483	Patients and Families	Allina Press	call: 612-775-9614
Web site with excellent resources for patient education resources, particularly using search terms "hypertension," "blood pressure" and "home monitoring."	Patients and Families	Mayo Health Oasis	http://www.mayoclinic.com
Web site with excellent resources for patient education. Includes an online catalogue of materials. - Facts about Heart Disease and Women: Preventing and Controlling High Blood Pressure (brochure #97-3655) - Facts about Lowering Blood Pressure (brochure # 5232) - Facts about the DASH Diet (booklet #03-4082) - Your Guide to Lowering Blood Pressure (booklet #03-5232)	Patients and Families	National Heart, Lung & Blood Institute (NHLBI)	http://www.nhlbi.nih.gov (Select Health Information and Publications, then select Heart/ Vascular Diseases.)