

Hypertension

June, 2004

(reformatted May, 2005)

(Federal Bureau of Prisons - Clinical Practice Guidelines)

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1. Purpose

The Federal Bureau of Prisons, Clinical Practice Guidelines for Hypertension provide recommendations for the medical management of inmates with hypertension.

2. Diagnosis

Diagnostic criteria: Hypertension is diagnosed with an accurately measured systolic blood pressure (SBP) of 140 mm Hg or greater or a diastolic blood pressure (DBP) of 90 mm Hg or greater. A lower diagnostic threshold for intervention (SBP of 130 mm Hg or greater or a DBP of 80 mm Hg or greater) is indicated for persons with diabetes and/or renal disease.

Methodology: Hypertension detection begins with the proper measurement of blood pressure. Measurements are optimally taken with a mercury sphygmomanometer; otherwise, a recently calibrated aneroid manometer or validated electronic device can be used. Diagnostic measurements of blood pressure should not be taken when inmates are taking antihypertensive drugs, when acutely ill, following the recent consumption of caffeine or use of nicotine, or during other situations where the reading may be falsely elevated or depressed from baseline. Blood pressure should be measured using the following guidelines:

- **Inmates should be seated in a chair with their backs supported and their arms bared and supported at heart level.** Ideally the inmate should sit quietly in this position for at least 5 minutes before the blood pressure is measured. Inmates ideally should refrain from smoking, eating, or ingesting caffeine during the 30 minutes prior to the measurement.
- **Under certain circumstances** (e.g., older persons, persons with coexisting cardiovascular disease, congestive heart failure, peripheral arterial disease or diabetes) **measuring blood pressure in the supine and standing positions may be helpful diagnostically.**
- **The appropriate cuff size** (12-14 cm wide for an average adult, 15 cm wide cuff on an obese arm) **must be used to ensure accurate measurement.** The bladder within the cuff should be about 80% of the circumference of arm, almost long enough to encircle the arm. Cuffs that are too short or too narrow may give falsely high readings. Using a regular-size cuff on an obese arm may lead to a false diagnosis of hypertension. The majority of males require a large blood pressure cuff.
- **The blood pressure should at first be estimated by palpation,** by obtaining the radial artery pulse and rapidly inflating the cuff until the radial pulse disappears. The estimated pressure plus 30 mm Hg should be the target for inflation and should prevent discomfort from an unnecessarily high cuff pressure. After inflating the cuff, the cuff should be deflated rapidly to the targeted pressure, then deflated slowly at a rate of 2-3 mm Hg per second. The first detected sound is used to define SBP. The disappearance of sound is used to define DBP.

- **The blood pressure should be taken in both arms at least once.** The normal difference in blood pressure between arms is 5 mm Hg or less and sometimes as much as 10 mm Hg. Subsequent readings should be measured on the arm with the higher pressure. A pressure difference of more than 10-15 mm Hg between arms suggests arterial compression or obstruction on the side with the lower pressure and warrants further evaluation.

Screening: Inmates should be screened for hypertension during intake and periodic physical examinations and during evaluations by BOP health care providers during sick call and chronic care clinic evaluations. Elevated readings should be reconfirmed on repeat visits as discussed below.

Diagnostic monitoring: Inmates diagnosed with hypertension should be monitored through individualized follow-up evaluations with a frequency dependent on the inmate's medical history, cardiovascular risk factors, symptoms, and the degree of hypertension detected. The following guidelines should be considered for monitoring inmates' blood pressures:

- **If SBP is < 120 mm Hg and DBP is < 80 mm Hg:** inmates should have their blood pressure rechecked at their next periodic physical examination.
- **If SBP is 120-139 mm Hg or DBP is 80-89 mm Hg:** inmates without cardiovascular disease or risk factors should be given information and education regarding lifestyle modification, and have their blood pressure rechecked in one year. Inmates with cardiovascular risk factors should be reevaluated during the next 6 months with repeated blood pressure measurements and should be referred to a clinician for classification and baseline evaluation if elevated blood pressure readings are confirmed. Inmates age 40 or older who have blood pressures in this range should also be screened for diabetes.
- **If SBP is 140-159 mm Hg or DBP is 90-99 mm Hg:** inmates should have their blood pressure rechecked within 2 months and if hypertension is confirmed should be referred to a clinician for classification and baseline evaluation.
- **If SBP is \geq 160 mm Hg or DBP is \geq 100 mm Hg:** inmates should have their blood pressure rechecked within one month or as soon as medically indicated, and if hypertension is confirmed should be referred to a clinician for classification and baseline evaluation.
- **If SBP is \geq 180 mm Hg or DBP is \geq 110 mm Hg:** inmates should be evaluated for signs or symptoms of acute target organ damage (see [Hypertensive Crises](#), below). Symptomatic inmates should be managed as a hypertensive emergency case or hypertensive urgency case. If the inmate is asymptomatic, he/she should be referred to a clinician immediately for confirmation of BP elevation and initiation of antihypertensive therapy, usually with two drugs (a thiazide plus either a beta-blocker or an ACE inhibitor as first choices.)

3. Classification

Blood pressure measurements in adults are classified into the following four categories:

Normal: SBP < 120 and DBP < 80

Prehypertension: SBP 120-139 and DBP 80-89

Stage 1 Hypertension: SBP 140-159 or DBP 90-99

Stage 2 Hypertension: SBP \geq 160 or DBP \geq 100

Classifying hypertension should be based on at least 2 or more appropriately measured readings after initially measuring a high blood pressure reading. The higher stage should be used to classify blood pressure status when systolic and diastolic blood pressures fall into different categories. In addition to classifying stages of hypertension on the basis of average blood pressure levels, clinicians should specify the presence or absence of target organ disease and cardiovascular risk factors, since these factors are important for classification and treatment purposes.

4. Baseline Evaluation

Objectives: The evaluation of persons with documented hypertension has three major objectives:

- 1) to identify known causes of high blood pressure;
- 2) to assess the presence or absence of target organ damage and cardiovascular disease, the extent of the disease, and the response to therapy;
- 3) to identify other cardiovascular risk factors, concomitant disorders or lifestyle concerns that may define prognosis and guide treatment.

Data for evaluation are acquired through medical history, physical examination, laboratory tests, and other diagnostic procedures. In general, the data derived from the initial history, physical examination and limited testing are sufficient to screen for secondary causes of hypertension. Further diagnostic testing should be undertaken only when clinically indicated on a case by case basis when signs or symptoms of secondary hypertension are suggested by the medical history or physical examination, or when blood pressure control is not achieved with more than two appropriate medications.

Medical history: The baseline medical history for inmates diagnosed with hypertension should be conducted by a clinician and include the following:

- **Documentation of age, sex, and race**, since end organ damage is much more common in the elderly, males, and African-Americans

- **Identification of associated cardiovascular risk factors:**
 - cigarette smoking
 - dyslipidemia
 - diabetes mellitus
 - obesity (body mass index ≥ 30 -- see [BMI calculation](#) below)
 - family history of premature cardiovascular disease (< age 55 in men, < 65 in women)
 - microalbuminuria or estimated GFR < 60 ml/min

- **Review of initial diagnosis of hypertension** if previously detected and its treatment including the following:
 - age at onset, stage of hypertension when initially detected, course of development and progression (sudden vs. gradual change), reliability of documentation, and associated symptoms
 - treatment history, including medications, dosages, responses to therapies, and drug side effects

- **Review of family history** for history of hypertension, coronary artery disease, diabetes mellitus, renal disease, dyslipidemia, and diseases related to secondary causes of high blood pressure, such as pheochromocytoma, MEN syndrome type II (medullary carcinoma of the thyroid and multiple endocrine neoplasia syndrome), neurofibromatosis, renal disease (e.g., polycystic kidney disease)

- **Review of medication history and habits:** use of prescribed, over-the-counter medications (e.g., oral contraceptives, decongestants, diet pills)

- **Degree of alcohol intake**

- **Dietary habits** with attention to excessive salt intake

- **Use of illicit drugs** that may affect blood pressure such as cocaine use

- **Attention to relevant portions of the social history:**
 - factors that may affect the inmate's ability to understand or participate in treatment recommendations such as educational level, language barriers, and disabilities
 - potential family or institutional stressors that may affect inmate health, such as relationships with family members and other inmates, work environment, and recent or anticipated court appearances

- **Review of systems** that focuses on the following:
 - **cardiovascular system:** presence or absence of symptoms of angina, myocardial infarction, prior history of coronary revascularization, congestive heart failure, claudication, stroke, or transient ischemic attacks
 - **pulmonary system:** presence or absence of symptoms of bronchospasm, asthma, or COPD

- **genitourinary system:** presence or absence of symptoms of renal disease (e.g., hematuria, prior calculi, nocturia, abnormal urinalysis, edema) and history of previous evaluations such as IVP studies or ultrasonography
- **endocrine system:** presence or absence of symptoms of pheochromocytoma (“spells” with hypertension and symptoms of headache, tachycardia and sweating), hyperthyroidism, hypothyroidism, hyperparathyroidism, Cushing's syndrome

Physical examination: The baseline physical examination should include a focused evaluation for evidence of target organ damage such as left ventricular hypertrophy, arterial bruits, absent pulses, retinopathy and focal neurologic deficits. The examination should include the following:

- **Two or more blood pressure measurements separated by two minutes** should be obtained, either supine or seated, and after standing for at least two minutes. A fall in SBP of 20 mm Hg or more from the supine to standing position, especially when accompanied by symptoms, indicates orthostatic (postural) hypotension and warrants further evaluation. **The two readings should be averaged.** If the two readings differ by more than 5 mm Hg, additional readings should be obtained and averaged.
- **Two measurements of leg pulses and pressures** should be made at least once with every hypertensive inmate. Absent, delayed, or diminished pulses in the femoral artery with low or unobtainable arterial pressures in the lower extremities, associated with hypertension in the upper extremities suggests coarctation of the aorta and warrants further evaluation.
- **Height and weight**
- **Calculation of body mass index (BMI):** $weight (lbs) \times 703 \div height squared (in^2)$
(See [References](#) for link to downloadable PDA version)
- **Funduscopy exam** for evidence of retinopathy (A-V nicking, hemorrhages or exudates with or without papilledema)
- **Examination of the neck** for carotid bruits, distended veins, and thyroid palpation
- **Heart examination** of rate and rhythm, precordial heave, clicks, murmurs, gallops, and assessment for cardiomegaly
- **Pulmonary exam** for evidence of rales or wheezing
- **Examination of the abdomen** for bruits, enlarged kidneys, masses, abnormal aortic pulsation
- **Examination of the extremities** for diminished or absent peripheral arterial pulsations, femoral bruits, or edema

- **Screening neurological exam**
- **Careful examination of skin** for café-au-lait spots, xanthomas, and stigmata of Cushing's syndrome

Diagnostic Evaluations - Routine: The following baseline laboratory tests should be obtained:

- BUN and creatinine
- Serum electrolytes
- Fasting blood glucose
- Fasting lipoprotein analysis
- Complete Blood Count (CBC) or hematocrit
- Urinalysis
- Electrocardiogram (ECG)

Diagnostic Evaluations - Supplemental: Other studies or procedures may be indicated to investigate potential secondary causes of hypertension, particularly in the following inmates:

- Age, medical history, physical exam, severity of hypertension, or initial laboratory findings suggest such secondary causes
- Blood pressures are responding poorly to drug therapy
- Well-controlled hypertension with unexpected increase in blood pressures
- Stage 2 hypertension
- Sudden unexpected onset of hypertension
- Specific clinical presentations that suggest possible renovascular hypertension include the following:
 - onset prior to 30 years of age
 - abdominal bruit, particularly if lateralized
 - hypertension resistant to treatment
 - recurrent pulmonary edema
 - renal failure of unknown cause, often with normal urine sediment
 - diffuse atherosclerosis in an inmate who smokes
 - acute renal failure precipitated by antihypertensive therapy, particularly ACE inhibitors

5. Treatment

The ultimate goal of preventing and effectively controlling hypertension is to reduce morbidity and mortality by the least intrusive means possible. **The primary focus of treatment should be achieving the target systolic blood pressure.** Most hypertensive individuals, especially those older than age 50, will reach the DBP goal once the SBP goal is achieved. Blood pressures less than 140/90 are associated with a decrease in cardiovascular complications. Treatment to lower levels may be useful, particularly to prevent stroke, to preserve renal function, and to prevent or slow heart failure progression. The targeted blood pressure should be < 130/80 mm Hg for patients with diabetes, and < 125/75 mm Hg for patients with renal insufficiency and proteinuria > 1 gram/24 hours. Blood pressure control is achieved by lifestyle modifications and as necessary, pharmacologic treatment.

Primary Prevention: All inmates should be advised during intake and periodic examinations to adopt lifestyle changes that will reduce their risk factors for cardiovascular disease. Primary prevention provides an important opportunity to interrupt or prevent hypertension and its complications based on the following considerations:

- A significant portion of cardiovascular disease occurs in persons with blood pressures above normal (120/80 mm Hg) but not high enough to be diagnosed or treated as hypertension. The risk of cardiovascular disease beginning at 115/75 mm Hg doubles with each increment of 20/10 mm Hg.
- Drug treatment of established hypertension has potential adverse effects on the patient.
- Most persons with established hypertension do not make sufficient lifestyle changes or consistently take their medications to achieve adequate control.
- Even if blood pressure is adequately treated to less than 140/90, these individuals are still at higher risk for complications compared to persons with normal blood pressure.

Lifestyle modifications: Once the diagnosis of hypertension is confirmed, non-pharmacological treatment with weight reduction, sodium restriction, and increased aerobic exercise are recommended. Many persons can meet blood pressure reduction goals without prescription medications. Lifestyle modifications should be the initial treatment for inmates with pre-hypertension, unless they have diabetes mellitus or multiple cardiovascular risk factors, cardiovascular disease, or evidence of target organ damage. The implementation of lifestyle modifications, however, should not delay the initiation of antihypertensive drug therapy when medically indicated in accordance with [Appendix 1 \(Classification and Management of Hypertension with Lifestyle Modifications and Drug Therapy\)](#).

Lifestyle modifications include the following:

- **Dietary management**

- **Sodium restriction** results in volume contraction and lowers blood pressure in some persons. The relative importance of sodium restriction for treating hypertension is uncertain, but is probably most important in sodium sensitive populations such as the elderly and African Americans. A sodium reduction to a level of no more than 3-4 grams per day is a realistic goal for most inmates at non-MRCs. Inmates with hypertension and co-morbid conditions at MRCs should ordinarily be prescribed a diet with no more than 2400 mg/day of sodium.
- **Caloric restriction** should be encouraged for inmates who are overweight. Normal BMI is 18.5 - 24.9. Systolic BP can be lowered 5 - 20 mm Hg for every 10 kg weight loss.
- **Restricting the intake of cholesterol and saturated fat** is recommended.
- **Daily requirements of dietary potassium and calcium** should be maintained. A diet high in fruits, vegetables, and low-fat dairy products will assure adequate intake of these minerals.
- **Caffeine** may raise blood pressure transiently, however, tolerance to this pressor effect develops rapidly, and no definitive relationship between caffeine intake and hypertension has been demonstrated.
- **Exercise:** Regular aerobic exercise within the limits of the inmate's cardiovascular status should be encouraged. Not only is exercise helpful in controlling weight, but there is also evidence that physical conditioning may lower arterial pressure. Isotonic exercise (e.g., jogging) is better than isometric exercises (e.g., weight lifting) since the latter, if anything, may raise arterial pressure.
- **Smoking cessation:** Cigarette smoking is a powerful risk factor for cardiovascular disease and its multiple complications. Inmates who smoke should be counseled repeatedly and unambiguously to stop smoking.
- **Alcohol use and illicit drugs:** The prohibited use of alcohol and illicit drugs such as cocaine can exacerbate hypertension and dangerously interact with antihypertensive medications. Inmates should be counseled about the deleterious health effects of using illicit drugs and the consumption of alcohol in large quantities.

Pharmacologic treatment: Drug therapy should be initiated if blood pressure is not adequately lowered by lifestyle modifications or if an inmate is classified with a more advanced stage of hypertension. Over 100 medications are available for the treatment of hypertension. Specific criteria should be considered when selecting an initial therapy, including the demographic characteristics of the inmate, concomitant diseases that may be beneficially or adversely affected by the antihypertensive agent chosen, BOP formulary status, and potential drug side effects and interactions.

Drug therapy for most inmates should begin with the lowest dose of medication to prevent adverse reactions of too great or too abrupt a reduction in blood pressure, and titrated gradually to the desired goal. The JNC 7 report notes that most hypertensive patients will require two or more medications to achieve their target blood pressure. If the inmate's blood pressure at the time of diagnosis is more than 20/10 mm Hg above the desired target, JNC 7 recommends consideration of initial therapy with two drugs, one of which should ordinarily be a thiazide diuretic. Most antihypertensive medications can be given once daily to improve inmate adherence.

Factors contributing to the appropriate selection of drug therapy for hypertension are outlined in [Appendix 2 \(Recommended Antihypertensive Drugs for Compelling Indications\)](#) and [Appendix 3 \(Other Drug Treatment Considerations For Hypertensive Inmates\)](#).

In uncomplicated hypertension, monotherapy with a diuretic should be the initial medication prescribed for most inmates. If, after an adequate trial of up to 50 mg hydrochlorothiazide or equivalent, blood pressure goals are not met, a beta-blocker or ACE inhibitor should be added unless there are compelling reasons to use another medication.

Special Treatment Considerations:

- **Ischemic Heart Disease**

Inmates with both hypertension and stable angina pectoris should ordinarily be taking a beta-blocker as part of their medication regimen; alternatively, a long-acting calcium channel blocker (CCB) can be used. Inmates with unstable angina or recent or remote myocardial infarction should be treated initially with either a beta-blocker or an ACE inhibitor (ACEI). Beta-blockers should be prescribed to most post-MI inmates, since they reduce the risk for reinfarction and sudden death (beta-blockers without intrinsic sympathomimetic activity should be prescribed). Calcium channel blockers are effective in this setting; however, these agents can aggravate angina and immediate-release forms should not be prescribed. Intensive lipid management and aspirin therapy are also indicated.

- **Heart Failure**

ACE inhibitors and beta-blockers are first line agents for treatment of hypertension complicated by heart failure. Symptomatic left ventricular dysfunction may also require the addition of an angiotensin receptor blocker (ARB), an aldosterone antagonist and/or a loop diuretic.

- **Diabetes**

Two or more medications are often required in diabetic hypertensive inmates in order to reduce blood pressure to less than 130/80. The ACEIs and ARBs are preferred since they delay progression of nephropathy. In addition, thiazides, beta-blockers, and long-acting CCBs can decrease morbidity from heart disease and stroke in diabetics. Beta-blockers may be problematic in persons taking insulin, because they blunt the symptomatic response to hypoglycemia, such as tachycardia and diaphoresis. Beta-blockers should be used cautiously in diabetic inmates and only when clearly indicated (e.g., coronary artery

disease).

- **Chronic Kidney Disease**

JNC 7 uses the conventional definition of chronic kidney disease as a GFR less than 60 ml/min, or a creatinine > 1.5 mg/ml in men or > 1.3 mg/ml in women. Most of these individuals will become hypertensive and should be treated aggressively to less than 130/80. As with diabetics, the ACEIs and ARBs are the preferred agents, although 2 or more drugs may be needed to reach target BP. Serum creatinine and potassium should be monitored with the initiation of ACE inhibitor therapy. Sustained elevations of BP with treatment suggests possible renal artery stenosis, that warrants further diagnostic evaluation and cessation of ACE inhibitor therapy. Thiazides should be used if the creatinine is less than 2-2.5 mg/ml, whereas inmates with creatinine levels above this range should be switched to a loop diuretic. Potassium-sparing diuretics should be avoided in persons with renal insufficiency.

- **Cerebrovascular Disease**

The risk of recurrent stroke is reduced by treating hypertension with a combination of an ACEI and a thiazide diuretic.

- **Demographic factors**

Age or gender do not markedly effect responsiveness to antihypertensive medications. The prevalence of hypertension in African Americans is among the highest in the world. Compared with whites, hypertension develops earlier in life and African Americans have higher rates of stage 2 hypertension, causing a greater burden of complications: an 80% higher stroke mortality rate, a 50% higher heart disease mortality rate, and a 320% greater rate of end-stage renal disease. Because of the high prevalence of cardiovascular risk factors in African Americans, such as obesity, cigarette smoking, and type 2 diabetes, as well as increased responsiveness to reduced salt intake, lifestyle modifications are particularly critical interventions. African Americans respond less well to monotherapy with an ACEI or beta-blocker, however when combined with adequate doses of a thiazide, these differential responses are minimized. It should be noted, however, that ACEI-induced angioedema occurs 2 to 4 times more frequently in African Americans than in other groups.

- **Geriatrics**

Over two thirds of individuals over age 65 have hypertension. The goals for treating older individuals should be the same as in younger persons, although lower initial medication doses may be required to avoid intolerable side effects. Standard doses of multiple drugs are usually required in older individuals, in order to achieve target blood pressures.

- **Asthma/COPD**

Non-selective beta blockers (e.g., propranolol) should not be prescribed to inmates with hypertension and asthma or chronic obstructive pulmonary disease except in unique situations, since these agents may cause bronchospasm and exacerbate pulmonary disease.

- **Pregnancy**

Methyldopa, beta-blockers and vasodilators are the preferred drugs for hypertension in pregnancy. Methyldopa has been evaluated most extensively and is therefore recommended for women whose hypertension is first diagnosed during pregnancy. ACE inhibitors and angiotensin II receptor blockers should not be used during pregnancy, or in women who may become pregnant, due to potential teratogenicity.

- **Hormone replacement therapy and oral contraceptives**

The presence of hypertension is not a contraindication to postmenopausal estrogen replacement therapy. Oral contraceptives containing both estrogen and a progestin may increase blood pressure. Female inmates treated with oral contraceptives for menstrual disorders should have their blood pressure monitored more frequently once such therapy is instituted.

Treatment failure: Clinicians should investigate the causes for treatment failure for inmates with poorly controlled hypertension as outlined in [Appendix 4 \(Causes of Treatment Failure for Hypertension\)](#), and consider the following questions:

- ▶ *Is the inmate adhering to the antihypertensive regimen?*
- ▶ *Should directly observed therapy (“pill line”) be considered for a limited time to assess compliance?*
- ▶ *Does the inmate understand the importance of taking medications?*
- ▶ *Is the inmate limited by language barriers or disabilities that require specific educational efforts?*
- ▶ *Is the inmate taking other medications that may elevate blood pressure?*
- ▶ *Does the inmate have any medical conditions that may result in secondary hypertension?*
- ▶ *Is there any evidence of illicit drug usage, such as cocaine that may exacerbate hypertension?*
- ▶ *Is the drug regimen appropriate for this inmate?*
- ▶ *Can blood pressure control be anticipated with titration of the dosage of the drug upward?*
- ▶ *Should the current drug be replaced with another drug from a different class with a different mechanism of action?*
- ▶ *Should combination drug therapy be considered?*

Inmates with poorly controlled hypertension should be referred for personal or group education provided by a qualified health care provider. If blood pressure remains poorly controlled secondary causes of hypertension should be investigated. Consultation with a physician with expertise in treating hypertension should be considered.

Hypertensive crises:

- **Hypertensive emergencies** consist of acute blood pressure elevation associated with signs or symptoms of target organ damage, such as hypertensive encephalopathy, intracranial hemorrhage, unstable angina pectoris, acute myocardial infarction, acute left ventricular

failure with pulmonary edema, dissecting aortic aneurysm, or eclampsia. **Hypertensive emergencies in BOP inmates require the immediate inmate transfer to a hospital setting for emergency evaluation and treatment.** Treatment of hypertensive emergencies with a parenteral agent prior to inmate transfer to the hospital should only be prescribed by BOP physicians experienced in treating hypertensive crises or who have consulted with a physician expert in the community.

- **Hypertensive urgencies** are those situations in which it is desirable to reduce blood pressure within a few hours (not necessarily to normal ranges) to prevent or limit target organ damage. Examples include upper levels of Stage 2 hypertension, hypertension with optic disc edema, progressive target organ complications and severe perioperative hypertension. Elevated blood pressure alone, in the absence of symptoms or new or progressive target organ damage, RARELY requires hospitalization. Hypertensive urgencies can be managed with oral doses of drugs with a relatively fast onset of action. Typically two complementary medications, such as a diuretic plus a beta-blocker or ACE inhibitor, are indicated in this setting. The choices include loop diuretics, beta-blockers, ACE inhibitors, alpha-2 agonists, or calcium antagonists. Inmates with hypertensive urgencies should be immediately referred to a BOP physician for evaluation and treatment.

The initial goal of therapy in hypertensive crises is to reduce mean arterial pressure by no more than 25% (within minutes to 2 hours), then toward 160/100 mm Hg (within 2-6 hours), avoiding excessive falls in pressure that may precipitate renal, cerebral, or coronary ischemia. Although sublingual administration of fast acting nifedipine has been widely used for this purpose, serious adverse effects have been reported with this nonformulary medication due to the inability to control the rate or degree of fall in pressure. Blood pressure should be monitored over a 15 to 30 minute interval; if it remains greater than 180/120 mm Hg, one of the previously mentioned oral agents may be considered. If the inmate's hypertension does not respond to oral agents, or signs of a hypertensive emergency develop, the inmate should be transferred to a hospital for emergency care.

6. Periodic Evaluations

Most inmates with hypertension should be seen within 1 to 2 weeks after initiation of therapy by a clinician to assess adherence to drug therapy, the efficacy of treatment, and potential adverse reactions that are likely to affect compliance. More frequent monitoring may be necessary for inmates with Stage 2 hypertension. Counseling about tolerance to side effects such as fatigue and impotence after several weeks of treatment may reassure the inmate that continuation of the medication is acceptable.

If the initial follow-up visit identifies no significant concerns related to drug compliance, the next visit should be in 1-2 months to assess the adequacy of hypertension control. Once blood pressure is stabilized, follow-up should occur during periodic clinician evaluations depending on the severity of hypertension and its complications.

Routine Chronic Care Evaluations

Routine chronic care clinic evaluations for hypertension should include the following:

- **Medical history:** The patient history should target the following:
 - Review of adherence to recommended lifestyle modifications
 - Review of adherence to any prescribed drug regimen and assessment of side effects
- **Physical examination:** The examination should include the following elements:
 - Measurement of vital signs, including blood pressure
 - Evaluation of heart, lungs, pulses, and extremities
 - Palpation and auscultation of the abdomen for evidence of an aortic aneurysm
 - Funduscopic exam at least annually and whenever clinically indicated
- **Laboratory evaluations:** High dosages of thiazide diuretics (e.g., greater than 100 mg of hydrochlorothiazide or equivalent) may be associated with an increased risk of side effects, including cardiac arrest, probably related to hypokalemia. Inmates receiving diuretics should be monitored for hypokalemia, and prescribed potassium sparing diuretics and/or potassium supplementation as necessary to maintain serum potassium levels.
- **Inmate education:** Inmates should be counseled by health care providers on the natural history of untreated hypertension, lifestyle modifications, specific treatment recommendations, and drug side effects. More intensive personal or group educational efforts should be considered for inmates with poorly controlled hypertension. Available BOP educational materials include [Appendix 5 \(Patient Education Program - Hypertension\)](#); [Appendix 6 \(Inmate Fact Sheet - Hypertension\)](#); and [Appendix 7 \(Inmate Fact Sheet - Reducing Dietary Sodium\)](#).

Documentation: Clinician evaluations and treatment of inmates with hypertension should be documented in the inmate's medical record. The BOP chronic care flow sheet for hypertension (BPS669.060) is recommended for inmates who will be monitored for over 1 year.

7. Health Care Staff Resources and Self Assessment

Resources for health care staff are listed in [Appendix 8 \(Resources - Management of Hypertension\)](#).

References

Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. National Heart, Lung, and Blood Institute, Pub. No. 98-4083. www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.htm

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The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, *Archives of Internal Medicine*, 1997;157:2413-2446.
<http://invest-trial.org/docs/jnc6.pdf>

Appendix 1. Classification and Management of Hypertension with Lifestyle Modifications and Drug Therapy		
BP Classification[§]	Without Compelling Indication	With Compelling Indications*
Normal SBP < 120 <u>and</u> DBP < 80	Encourage lifestyle modifications where appropriate	Encourage lifestyle modifications where appropriate
Prehypertension SBP = 120-139 <u>or</u> DBP = 80-89	Lifestyle modifications [†] No antihypertensive medications indicated without compelling condition	Lifestyle modifications [†] Utilize drugs shown beneficial for the compelling indications (<i>Appendix 2</i>)
Stage 1 Hypertension SBP = 140-159 <u>or</u> DBP = 90-99	Lifestyle modifications [†] Thiazide diuretics first-line for most inmates; if uncontrolled by thiazide alone or unable to tolerate thiazide, consider adding β -blocker or ACEI. ‡	Lifestyle modifications [†] Utilize drugs shown beneficial for the compelling indications (<i>Appendix 2</i>)
Stage 2 Hypertension SBP \geq 160 <u>or</u> DBP \geq 100	Lifestyle modifications [†] 2 drug combination required for most inmates; Thiazide diuretic plus β -blocker or ACEI. ‡	Lifestyle modifications [†] Utilize drugs shown beneficial for the compelling indications (<i>Appendix 2</i>)
SBP = systolic blood pressure, DBP = diastolic blood pressure		
<p>[§]Classification is determined by the highest category; e.g., if SBP is 130 but DBP is 95, this is Stage 1 hypertension.</p> <p>*Compelling indications are heart failure, recent MI, presence of greater than two risk factors for coronary disease, prior stroke, diabetes, or chronic kidney disease (<i>Appendix 2</i>).</p> <p>[†] Lifestyle modification should be adjunctive therapy for all inmates recommended for pharmacologic therapy.</p> <p>[‡]Calcium channel blockers and angiotensin receptor blockers may also be considered; however, since these medication classes are more costly and have not been shown to have unique benefits over beta-blockers or ACE inhibitors, inmates must first fail or be intolerant to beta-blockers or ACE inhibitors before CCB or ARB therapy.</p>		
Source: Adapted from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. <i>JAMA</i> 2003;289:2560-2572.		

Appendix 2. Recommended Antihypertensive Drugs for Common Comorbidities by Indication*						
Condition	Diuretic	β-Blocker	ACEI	ARB	CCB	Aldosterone Antagonist
Post Myocardial Infarction		X	X			X
High Coronary Disease Risk	X	X	X		X	
Heart Failure	X	X	X	X		X
Recurrent Stroke Prevention	X		X			
Diabetes	X	X	X	X	X	
Chronic Kidney Disease			X	X		

*Use of these medications has been shown to reduce morbidity and mortality for the conditions listed. Specific drug selection should be based on the parallel goals of optimal blood pressure control and reduction of symptoms or target organ damage associated with the compelling indication.

Appendix 3. Anti-Hypertensive Drug Treatment Considerations for Less Common Comorbidities		
Inmate Characteristics	Preferred Drugs	Not Preferred (may have adverse effects)
Supraventricular tachyarrhythmias	Verapamil; Beta-blocker	
Bradycardia, sick sinus syndrome		Beta-blocker; diltiazem; verapamil
Cerebrovascular disease		Alpha 2-receptor agonist
Dyslipidemia	Alpha-blocker	Diuretics (high dose); Beta-blocker (non-ISA)
Migraine	Beta-blocker	
History of depression		Alpha 2-receptor agonist; reserpine; Beta-blocker
Peripheral vascular disease	ACE inhibitor; Ca-channel blocker; Alpha-blocker	Beta-blocker
Renal insufficiency	Loop diuretic; minoxidil; ACE inhibitor	Thiazide diuretic; Potassium-sparing agent
Collagen disease	ACE inhibitor; Ca-channel blocker	Methyldopa; hydralazine
Gout		Diuretic
Asthma		Beta-blocker
Osteoporosis	Diuretic	

Appendix 4. Causes of Treatment Failure (“Resistant Hypertension”)

1. Nonadherence to Therapy

- ▶ Inmate concerned about confidentiality
- ▶ Inadequate inmate education
- ▶ Lack of involvement of the inmate in the treatment plan
- ▶ Adverse effects of medication
- ▶ Organic brain syndrome

2. Pseudoresistance

- ▶ “White-coat hypertension” or clinic elevations
- ▶ Incorrect cuff size (use of regular cuff on large arm)

3. Drug related causes

- ▶ Doses too low
- ▶ Wrong type of drug
- ▶ Inappropriate combinations
- ▶ Drug interactions and actions including NSAID’s, COX-2 inhibitors, oral contraceptives, sympathomimetics (amphetamines, including appetite suppressants, and decongestants) antidepressants, adrenal steroids, licorice (as may be found in chewing tobacco), dietary supplements containing ephedra, ma huang, or bitter orange, cocaine, cyclosporine, tacrolimus, erythropoietin

4. Associated Conditions

- ▶ Smoking
- ▶ Increasing obesity
- ▶ Excessive alcohol use

5. Volume Overload

- ▶ Excessive salt intake
- ▶ Renal insufficiency
- ▶ Inadequate diuretic therapy
(e.g., using a thiazide instead of a loop diuretic where creatinine is > 2)
- ▶ Fluid retention from reduction of blood pressure

6. Secondary Hypertension

- ▶ Renovascular hypertension
- ▶ Pheochromocytoma
- ▶ Primary aldosteronism

Appendix 5. Patient Education Program - Hypertension	
Objectives	
<ul style="list-style-type: none">▶ Define hypertension and its relationship to heart disease and stroke.▶ Describe the effects of hypertension and why you should keep it under control.▶ List measures to lower your blood pressure and reduce your risk of heart disease and stroke.	
Facts	
<p>Hypertension is also called high blood pressure. Most people with hypertension feel fine and may not even know that they have high blood pressure. High blood pressure has been called "The Silent Killer," since it may be life threatening if left untreated. However, with proper care, hypertension can be adequately treated in most patients. Most people with high blood pressure (about 95%) have essential hypertension, meaning the cause is not known. The other 5 percent have secondary hypertension, which means a specific cause can be identified.</p>	
Diagnosis	
<p>Measuring blood pressure is no more than measuring the pressure required to force blood through blood vessels.</p> <ul style="list-style-type: none">▶ Systolic blood pressure, the top number, measures the force while the heart pumps. A normal, healthy systolic blood pressure is 120 or below.▶ Diastolic blood pressure, the bottom number, measures the force at rest - that is, in between heart pumps. A normal, healthy diastolic blood pressure is 80 or below. <p>While the diastolic blood pressure stays at about the same level all the time, systolic blood pressure changes frequently depending on day-to-day activities and stress. An occasional elevated number may not indicate high blood pressure. It takes several repeatedly elevated pressures to diagnose hypertension. When blood pressure is too high (either systolic or diastolic or both) and remains high, blood cannot flow freely through the arteries and the heart has to pump harder.</p>	
Stages	
<ul style="list-style-type: none">▶ "Normal" or "desirable" blood pressure is below 120 mm Hg systolic and 80 mm Hg diastolic. This may also be called "optimal" blood pressure.▶ "Prehypertension" blood pressure is between 120 and 139 systolic or 80 to 89 diastolic.▶ "Stage 1 Hypertension" is 140 to 159 systolic or 90 to 99 diastolic.▶ "Stage 2 Hypertension" is greater than 160 systolic or greater than 100 diastolic.	

Appendix 5. Patient Education Program - Hypertension

Consequences of uncontrolled hypertension

The most severe consequences of hypertension are stroke, kidney failure, congestive heart failure, heart attack and blindness.

- ▶ **Stroke** results when the arteries in the brain become blocked. Without blood, and the oxygen and nutrients carried by the blood, brain tissue dies and the functions controlled by that part of the brain are lost. A stroke can also result from too much pressure in blood vessels that burst and bleed into the brain. The consequences, or long-term effects of a stroke can range from paralysis on one side of the body, including the face, eyes and mouth; difficulty speaking, eating, or managing the simple activities of daily living to total paralysis, difficulty breathing, and death.

- ▶ **Kidney failure** occurs when tiny vessels in the kidneys become blocked. Because the kidneys shrink and become irregular, they can no longer cleanse the body of wastes. As kidney failure increases, the body is slowly poisoned and dialysis or organ transplantation may be necessary.

- ▶ **Congestive heart failure (CHF)** means that enough fluid is not being eliminated from the body, and excess fluid ends up in the lungs and around the heart. Several things happen: the heart has to work extra hard; the person becomes short of breath, sometimes with a cough; the heart is enlarged because it has to work harder; fluid is retained around the ankles; the person becomes weak; and if something is not done medically, the heart will quit working. The heart muscle slowly loses its elasticity and the heart enlarges and becomes weaker.

- ▶ **Heart attack**, also called myocardial infarction (MI), occurs when the blood vessels that supply the heart muscle with blood and oxygen become blocked. Often the heart gives warning that something is going wrong by producing angina (or chest pain). Nitroglycerin is taken by mouth to control the chest pain. If chest pain occurs and blood pressure is not controlled, there is a risk of heart attack and death.

Appendix 5. Patient Education Program - Hypertension (page 3)

Treatment: Lifestyle Changes

Lifestyle changes are the first line of treatment for hypertension and include the following:

- ▶ **Weight reduction:** Losing weight may lower blood pressure to a normal level or may allow a reduction or elimination of medication by a doctor. In fact, being overweight may even make it more difficult for blood pressure medication to work. Check with a health care provider to determine an ideal body weight.
- ▶ **Aerobic exercise** makes the heart and blood vessels function more effectively and can assist in weight reduction. Walking or stationary bicycling for at least 30 minutes three to five times a week are good aerobic choices. Avoid muscle building exercises, such as weight lifting, which may increase blood pressure. Check with a health care provider before starting any exercise program. Begin exercise slowly and increase the level of exercise gradually - don't overdo it.
- ▶ **Restrict (sodium) intake** to between 3 and 4 grams per day (that's about 1.5 to 2 teaspoons of salt) including both the salt added to food and the salt already present in food. Commercially prepared food (processed meat, flavored rice mixes, and instant pasta mixes) contain a large amount of salt. Eliminating added salt from the diet is an important way to lower blood pressure.
- ▶ **Restrict dietary fat:** Eating too much fat leads to weight gain. Some fats, particularly animal fats, contain cholesterol which can lead to plaque buildup inside blood vessels which can lead to high blood pressure and other serious conditions.
- ▶ **Stop smoking:** Smoking damages and constricts blood vessels and is, by itself, a risk factor for stroke and heart disease. In fact, smoking a cigarette within 20 minutes before a blood pressure is taken can actually cause a higher reading.
- ▶ **Avoid extra caffeine:** Drinking more than 2 or 3 cups of coffee or other caffeinated beverage each day may raise blood pressure. Caffeine can quickly raise blood pressure, but it generally does not keep it elevated. Try substituting decaffeinated coffee, tea, or soda.

Not only can lifestyle changes help lower your blood pressure, but a new sense of pride can be found as you successfully make changes toward a healthier lifestyle. Consult with a health care provider on how to plan and proceed with these changes.

Appendix 5. Patient Education Program - Hypertension

(page 4)

Treatment: Medications

Your doctor may prescribe medications if lifestyle changes alone do not control your blood pressure or if your blood pressure is exceptionally high. A doctor and/or other health care provider will explain the medication, including side effects, and will closely monitor how well it controls blood pressure. Most people have few side effects after beginning medications; however, if different or worse symptoms appear after taking the medication, tell a health care provider right away. High blood pressure medication only works when it's taken as directed. So follow the instructions and take medication at the same time every day. Never stop taking a medication without a doctor's consent. Suddenly stopping high blood pressure medication can cause a sudden, life-threatening increase in blood pressure.

The medication selected will be based on factors which make it more likely that the medication will work to lower the blood pressure. These factors include race, sex, age, and the presence of other medical conditions.

There are several major groups of high blood pressure medications:

- ▶ **Diuretics** or “water pills” such as hydrochlorothiazide remove excess fluid from the body, thus requiring less work by the heart. Diuretics also remove salts from the body. While it is helpful to remove excess sodium, some diuretics can also remove potassium. In order to avoid losing too much potassium, adequate fruits and vegetables should be consumed. Diuretics are often the first medication used to treat hypertension, and can be extremely effective.

- ▶ **Beta-Blockers** are also frequently used as early treatment for high blood pressure. Some beta blockers are used to treat high blood pressure when there are other problems present such as angina, heart beat irregularities and palpitations, or after a heart attack. Some beta-blockers are avoided in the presence of asthma because they may worsen wheezing and breathing problems.

- ▶ **Angiotensin Converting Enzyme Inhibitors** - or ACE inhibitors - are particularly effective when used in diabetics to help slow the progression of kidney damage. ACE inhibitors are also used with congestive heart failure and to decrease the development of heart failure.

- ▶ **Calcium Channel Blockers** are often used in the presence of angina, rapid heart rate, and erratic heart rate.

Appendix 5. Patient Education - Hypertension (page 5)

Drug Interactions

Certain medications can raise blood pressure. These include:

- ▶ Decongestants or cold preparations containing pseudoephedrine or phenylpropanolamine.
- ▶ Nonsteroidal anti-inflammatory drugs (NSAIDs) including ibuprofen (Motrin), naproxen (Anaprox), sulindac (Clinoril), piroxicam (Feldene), indomethacin (Indocin) and others can also cause problems.
- ▶ Steroids, antidepressants, birth control pills, and many illegal drugs such as cocaine, PCP, and all drugs similar to amphetamines can cause dangerous increases in your blood pressure.

Summary

There are three very important concepts to remember related to hypertension:

- ▶ **Controlling blood pressure is something that will be ongoing for a lifetime.** Control of high blood pressure can be assisted by eating sensibly, exercising regularly, and quitting smoking.
- ▶ **If medication is needed to control blood pressure, it should be taken every day, and at the same time every day.** Remember that certain drugs may cause blood pressure to go up, or may interact with blood pressure medication.
- ▶ **Controlling blood pressure may help you avoid several very serious conditions - heart attack, stroke, kidney failure, and blindness.** Be aware of side effects that might be related to the medications being taken. Seek medical attention if you develop any symptoms of dangerously high blood pressure, such as: severe headache, confusion, or dizziness; severe chest or back pain; severe shortness of breath; weakness or numbness in the arms or legs; coughing up blood or nose bleeds, or visual disturbances.

Appendix 6. Inmate Fact Sheet - Hypertension

Hypertension (high blood pressure) is known as the “silent killer” since it damages your heart, kidneys, blood vessels, and eyes even though you don’t know you have the disease.

Stages of Hypertension

Stage	Systolic Pressure	Diastolic Pressure
Normal (Optimal)	below 120	below 80
Prehypertension	120 - 139	80 - 89
Stage 1 Hypertension	140 - 159	90 - 99
Stage 2 Hypertension	160+	100+

Risk Factors for Hypertension

- ▶ Smoking
- ▶ High cholesterol
- ▶ Diabetes
- ▶ Age older than 60
- ▶ Male of any age
- ▶ Women after menopause
- ▶ Family history of heart disease

Target Organ Damage

- ▶ Stroke
- ▶ Kidney failure
- ▶ Peripheral artery disease
- ▶ Eye damage/visual loss
- ▶ Angina (chest pain) and heart attack
- ▶ Heart failure

Life Style Changes to Reduce Blood Pressure

- ▶ Stop smoking
- ▶ Restrict salt intake
- ▶ Exercise/weight reduction
- ▶ Avoid extra caffeine
- ▶ Lower cholesterol levels
- ▶ Restrict alcohol use

Other Things That May Make Blood Pressure Control Difficult

- ▶ Use of anti-inflammatory medications
- ▶ Use of decongestants
- ▶ Use of illegal drugs
- ▶ Use of steroids

Appendix 7. Inmate Fact Sheet - Reducing Dietary Sodium

About Sodium (Salt)

- ▶ Sodium is a necessary mineral in our diets to maintain health. Our bodies need 500 mg of sodium per day, equal to one fifth of a teaspoon of salt.
- ▶ A reasonably healthy amount of daily dietary sodium is 3 to 4 grams daily or 1.5 to 2 teaspoons of salt, however most Americans eat 2 to 4 times more sodium than they need by salting foods and by eating foods high in sodium.
- ▶ Approximately 1/3 of our sodium intake comes from the sodium occurring naturally in foods, another 1/3 comes from sodium in processed foods, and the remaining 1/3 comes from the salt we add at the table.
- ▶ A significant reduction in sodium intake occurs for most persons if they do not use the salt shaker.
- ▶ Reducing dietary sodium is particularly beneficial for persons with hypertension, congestive heart failure, and renal insufficiency.

How to reduce sodium intake

- ▶ Read the labels on foods sold in the commissary. The labels list mg of sodium per serving. Considering what you eat in the dining room, and how much you salt your food, your daily intake of sodium from commissary foods should probably not exceed 500 mg.
- ▶ You can markedly reduce your sodium intake by limiting the following foods:
 - **Meats:** cured meats, bacon, sausage, ham, corned beef, bologna, frankfurters, luncheon meats, sardines, pickled herring, anchovies, and commercially canned or prepared meats. Rinse canned foods such as tuna to remove some of the excess sodium in the packing oil or water.
 - **Vegetables:** Sauerkraut, tomato juice, V-8 juice.
 - **Fats:** Bacon fat, gravies (unless prepared with low sodium ingredients).
 - **Breads and Cereals:** Salted crackers, salted snack foods such as potato chips, pretzels, salted nuts, salted popcorn. Limit dry cereal to 3 cups/day.
 - **Soups:** Commercial soups and bouillon, soup mixes and broth.
 - **Desserts:** Limit commercially prepared pies, cakes, cookies and pastries.
 - **Condiments:** Salt, seasonings which contain salt such as celery salt, garlic salt, onion salt, soy sauce, monosodium glutamate, meat tenderizers, barbecue sauce, Worcestershire sauce, pickles, relish, olives. Limit salad dressing to 4 tablespoons/day.
 - **Dairy:** Limit milk to 2 cups/day, buttermilk to 1 cup/day, natural cheese to 2 ounces/day, cottage cheese to one half cup/day, and avoid processed cheeses altogether.

Appendix 8. Resources - Hypertension Management

American College of Cardiology 800-253-4636 www.acc.org

American Heart Association 800-242-8721 <http://www.americanheart.org>

National Institutes of Health

Body Mass Index Calculator for Palm OS Handheld Devices:

http://hin.nhlbi.nih.gov/bmi_palm.htm

Facts About the DASH Eating Plan. NIH Publication No. 03-4082.

<http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/>

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National Heart, Lung, and Blood Institute Information Center. www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.htm