We depended mainly on five sources in constructing quality indicators for hypertension. For screening for hypertension, we used three organizations’ published guidelines: the Canadian Task Force on the Periodic Health Examination (CTF), the United States Preventive Services Task Force (USPSTF) and the American College of Physicians (ACP) (CTF, 1984; USPSTF, 1996; Hayward et al., 1991; Littenberg et al., 1991, in Eddy, 1991; Littenberg, 1995). For indicators of treatment and follow-up care we relied upon the Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V) and a recently published meta-analysis of 14 studies of the treatment of hypertension (NHBPEP, 1993; Collins et al., 1990). The JNC V has been endorsed by more than 30 medical specialty organizations. When these core references cited studies to support individual indicators, we have referenced the original source. When the core references were unclear in their support for a particular indicator, we performed a focused MEDLINE search for articles addressing that topic.

IMPORANCE

Hypertension is one of the most common medical conditions. It is present in an estimated 43 million Americans (USPSTF, 1996). Most of the morbidity from hypertension derives from the damage it does to target organs. It is a leading risk factor for coronary artery disease, congestive heart failure, renal disease and stroke (USPSTF, 1996). Hypertension often goes undetected and even when detected may be inadequately treated. The second National Health and Nutrition Examination Survey (NHANES II) found that among hypertensive adults, 54 percent were aware of their condition, 33 percent took medications for

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1 This chapter is a revision of one written for an earlier project on quality of care for women and children (Q1). The expert panel for the current project was asked to review all of the indicators, but only rated new or revised indicators.
it, and only 11 percent were under control (NHBPEP, 1985). Hypertension is also a costly disease; patients under treatment spend about $900 to $1,400 annually for drugs, laboratory tests, and provider visits (Hilleman et al., 1994).

SCREENING

No randomized trials or observational studies have directly evaluated screening unselected patients for hypertension. Nonetheless, based on the demonstrated efficacy of treatment (see below), several widely accepted guidelines have been promulgated. The USPSTF recommends that all adults undergo blood pressure screening every two years for those with diastolic and systolic blood pressures below 85 mm Hg and 140 mm Hg, respectively, and every year for those with diastolic blood pressures of 85 to 89 mm Hg. The ACP makes no recommendations about the frequency of blood pressure measurement, but urges screening of all patients presenting for care. The CTF recommends that blood pressure be measured at every medical visit (USPSTF, 1996; Littenberg et al., 1991, in Eddy, 1991; Hayward et al., 1991; Littenberg, 1995; CTF, 1984)(Indicator 1).

Estimates of the cost-effectiveness of screening patients for hypertension vary widely. While the screening test itself poses little risk to the patient’s health, incorrectly labeling a patient as hypertensive may. Searching for secondary causes of hypertension may entail some invasive procedures and pharmacologic therapy may have side effects. Cost-effectiveness studies have supported case finding (the measurement of blood pressure in patients presenting for care for other reasons) over mass screening, finding that each quality-adjusted life-year saved costs about $15,000 (Weinstein, 1976). More recent studies have estimated the cost-effectiveness of screening middle-aged women to be in the range of $23,000 per quality-adjusted life-year (Eddy, 1991; Littenberg, 1995).
DIAGNOSIS

Measurement Technique

The measurement of systolic and diastolic blood pressure using a mercury sphygmomanometer cuff is one of the oldest objective measures in medicine. Because its use predated modern experimental design, it is difficult to assess its efficacy. Studies have shown some difficulties in cuff measurements of the blood pressure of obese and elderly patients when compared to more invasive and impractical intra-arterial measurements, but virtually all studies of the natural history and treatment of the disease have been based on cuff measurements.

Classification

The JNC V introduced a new diagnostic staging system based on the degree of elevation of cuff measurements, which is shown in Table 11.1.

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic (mm Hg)</th>
<th>Diastolic (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;130</td>
<td>&lt;85</td>
</tr>
<tr>
<td>High normal</td>
<td>130-139</td>
<td>85-89</td>
</tr>
<tr>
<td>Stage 1 (mild)</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Stage 2 (moderate)</td>
<td>160-179</td>
<td>100-109</td>
</tr>
<tr>
<td>Stage 3 (severe)</td>
<td>180-209</td>
<td>110-119</td>
</tr>
<tr>
<td>Stage 4 (very severe)</td>
<td>&gt;210</td>
<td>&gt;120</td>
</tr>
</tbody>
</table>


Natural history studies of mild hypertension and the placebo arms of interventional studies have shown extreme variability in the blood pressures of Stages 1 to 2 hypertensives (Management Committee of the Australian National Blood Pressure Study, 1980; Medical Research Council Working Party, 1985). For that reason, the JNC V recommends using the
average of three measurements documented over the course of several weeks to confirm the diagnosis (Indicators 2 and 3).

**Initial History and Physical**

The initial history and physical of the newly diagnosed hypertensive patient searches for secondary causes, target organ disease and additional cardiac risk factors. A focused literature search revealed no direct evaluation of the value of the history and physical in preventing complications or death, so we have relied upon expert opinion. We modified the recommendations in the JNC V consensus statement to produce our quality indicators (Indicator 4).

**Initial Laboratory Examination**

Like the initial history and physical, initial laboratory tests search for secondary causes, target organ damage, and other cardiac risk factors. In addition, these tests may serve as a baseline for monitoring the side effects of pharmacotherapy. A focused literature review again revealed no direct evaluation of routine testing, so we again modified the JNC V recommendations when constructing our indicators (Indicator 6).

**Secondary Hypertension Due to Drugs**

Clinical trials have associated many drugs with the development of hypertension, including oral contraceptives, steroids, nasal decongestants, appetite suppressants, cyclosporine, erythropoietin, tricyclic antidepressants, and monoamine oxidase inhibitors. The JNC V recommends the discontinuation of these drugs (at least temporarily) to determine if they are the cause of the patient’s hypertension (Indicator 5).

**TREATMENT**

**Lifestyle Changes**

Most experts recommend nonpharmacological lifestyle changes (e.g., weight reduction, low sodium diet, physical activity, alcohol avoidance) as the first line of treatment in Stage 1-3 hypertension. The evidence for such recommendations is fairly solid. An observational trial of 301
obese patients revealed significant declines in blood pressure in those who successfully lost weight (Schotte and Stunkard, 1990). A randomized trial of 878 Stage 1-2 patients who were more than ten percent above their ideal body weight showed that weight loss enhances the antihypertensive effect of medication (Langford et al., 1991). Avoiding dietary sodium reduces systolic blood pressure by an average of 4.9 mm Hg and diastolic blood pressure by 2.6 mm Hg according to a meta-analysis of 23 randomized trials with 1536 subjects (Cutler et al., 1991). Patients with low levels of physical fitness, as measured by treadmill, developed hypertension one and a half times more often in a cohort of 4820 men and 1219 women observed for four years (Blair et al., 1984). Epidemiological studies have linked excessive alcohol consumption and hypertension. In addition, a randomized controlled trial of 41 heavy drinkers supports this association. Though this randomized trial was plagued by a high dropout rate, it demonstrated that physicians simply advising patients to reduce their alcohol consumption resulted in an average drop of more than 5 mm Hg in systolic blood pressure (Maheswaran et al., 1991) (Indicators 7 and 8).

**Pharmacotherapy**

If nonpharmacologic measures do not lower the blood pressure to normal levels or if the patient has Stage 4 disease, the JNC V recommends the addition of medication to the patient’s regimen. A meta-analysis of 14 randomized trials has demonstrated a 42 percent reduction in strokes, a 14 percent reduction in coronary heart disease and a 12 percent reduction in all-cause mortality over four to six years of follow-up (Collins et al., 1990; Hebert et al., 1988) (Indicators 9 and 10). These studies have predominantly used middle-aged or elderly men as subjects (Anastos et al., 1991). The benefits of pharmacologic treatment are most pronounced among those with Stage 4 hypertension, increasing five-year survival from close to zero to 75 percent (Hansson, 1988).

**Choice of Pharmacologic Agent**

Although many classes of drugs (e.g., angiotensin-converting enzyme inhibitors, calcium channel blockers, direct vasodilators, centrally
acting alpha antagonists) have been proven effective at lowering blood pressure, only beta blockers and diuretics have demonstrated in randomized controlled trials that they effectively lower mortality. Indeed, recent observational data have given rise to the suspicion that calcium channel blockers may increase overall mortality (Psaty et al., 1995). All 14 trials cited in the above meta-analysis used beta blockers or diuretics to lower the blood pressure of the intervention group. While awaiting data expected in 2001 from ALLHAT (Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack), a randomized trial evaluating ACE inhibitors, calcium channel blockers, centrally acting agents and cardiovascular morbidity and mortality, the JNC V recommended initial pharmacologic therapy with either a diuretic or a beta blocker.

Concomitant Disease

The presence of concomitant disease may alter this JNC V recommendation. Both beta blockers and thiazide diuretics are associated with mild increases in serum lipids, though this effect has not been shown to persist (Grimm et al., 1981). For that reason, some experts recommend avoiding these agents in patients with known hyperlipidemia. Similarly, some diabetics should avoid beta blockers because of the masking of hypoglycemic symptoms. Several randomized trials have shown that ACE inhibitors and calcium channel blockers delay the progression of diabetic nephropathy (Lederle, 1992; Baba et al., 1986; Bjorck et al., 1986; Marre et al., 1988; Hommel et al., 1986). The Systolic Hypertension in the Elderly Program (SHEP) clinical trial showed that low-dose diuretic-based (chlorthalidone) treatment is effective in preventing major cerebral and cardiovascular events in diabetic and nondiabetic older patients with isolated systolic hypertension (Curb et al., 1996) (Indicator 11). Asthmatic patients should avoid beta blockers due to their bronchoconstrictive effect (Barker et al., 1991). Many thiazide diuretics increase uric acid and should thus be avoided as initial therapy for patients with gout (Barker et al., 1991). Patients with known coronary artery disease but no dilated cardiomyopathy should receive beta blockers preferentially over
diuretics as initial therapy. Several randomized controlled trials have
demonstrated that beta blockers reduce mortality in such patients (First

**FOLLOW-UP**

No studies directly address the optimal follow-up period for
hypertensive patients. The JNC V recommends two visits each year. The
goal of antihypertensive therapy is to lower the blood pressure to
normal levels. If hypertension persists despite treatment, most experts
recommend altering the patient’s regimen. However, there is no
consensus as to the optimal algorithm for modifying the regimen.
Increasing the dose, changing to another class of agents, adding an
agent from another class, reducing the frequency of administration to
improve compliance, and renewed efforts at lifestyle modification are
all acceptable strategies.
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mild-to-moderate essential diastolic hypertension. Clinical

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treatment of mild hypertension on diastolic blood pressure.
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Management Committee of the Australian National Blood Pressure Study. 14

Marre M, G Chatellier, H Leblanc, et al. 29 October 1988. Prevention of
diabetic nephropathy with enalapril in normotensive diabetics with

Medical Research Council Working Party. 13 July 1985. MRC trial of
treatment of mild hypertension: Principal results. British
Medical Journal 291: 97-104.


**RECOMMENDED QUALITY INDICATORS FOR HYPERTENSION**

These indicators apply to men and women age 18 and older. Only the indicators in bold type were rated by this panel; the remaining indicators were endorsed by a prior panel.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Quality of Evidence</th>
<th>Literature</th>
<th>Benefits</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screening</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Systolic and diastolic blood pressure should be measured on patients otherwise presenting for care at least once each year.</td>
<td>III</td>
<td>USPSTF, 1996; Hayward et al., 1991; Littenberg et al., 1991, in Eddy, 1991; Littenberg, 1995; CTF, 1984</td>
<td>Decrease hypertensive complications.¹</td>
<td>Blood pressure measurement has been recommended by 3 widely accepted guidelines. Increased detection of asymptomatic hypertensives prompts treatment.</td>
</tr>
<tr>
<td><strong>Diagnosis</strong></td>
<td></td>
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</tr>
<tr>
<td>2. All patients with average blood pressures of &gt;140 systolic and/or &gt;90 diastolic as determined on at least 3 separate visits should have a diagnosis of hypertension documented in the record.</td>
<td>III</td>
<td>JNCV, 1993</td>
<td>Decrease hypertensive complications.</td>
<td>Timely diagnosis of hypertension prompts treatment.</td>
</tr>
<tr>
<td>3. Patients with a new diagnosis of stage 1-3 hypertension should have at least 3 measurements on different days with a mean SBP&gt;140 and/or a mean DBP&gt;90.</td>
<td>III</td>
<td>Management Committee of the Australian National Blood Pressure Study, 1980; Medical Research Council Working Party, 1985</td>
<td>Prevent medication side effects such as orthostatic hypotension, fatigue, and impotence.</td>
<td>Observational studies have shown variability in the blood pressure of patients with mild to moderate hypertension. False labeling of patients as hypertensive can lead to unnecessary treatment and potential medication side effects.</td>
</tr>
<tr>
<td>Indicator</td>
<td>Quality of Evidence</td>
<td>Literature</td>
<td>Benefits</td>
<td>Comments</td>
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<td>--------------------------------------------------------------------------</td>
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</tbody>
</table>
| 4. Initial history and physical of patients with hypertension should document assessment of at least 2 items from each of the following groups by the third visit:  
  • History: Family or personal history of premature CAD, CVA, diabetes, hyperlipidemia;  
  • Medication and substance abuse: Personal history of tobacco abuse, alcohol abuse, or taking of medications that may cause hypertension;  
  • Physical examination: Examination of the fundi, heart sounds, abdomen for bruits, peripheral arterial pulses, neurologic system. | III                 | NHBPEP, 1993     | Reduce or eliminate medication side effects. Prevent other symptoms from the underlying disease (e.g., renal failure from renal artery stenosis). Decrease synergistic risk of cardiovascular complications. Prevent hypertensive complications. | No controlled trials directly examine the elements of quality in the history and physical for hypertensives. These minimum recommendations from JNC V search for secondary causes, other cardiac risk factors, and target organ damage. Identification of secondary causes can eliminate the need for therapy. Staging of target organ damage should prompt more aggressive control of hypertension for advanced disease. |
<p>| 5. Stage 1 hypertensive patients taking drugs that may cause hypertension should have the drug discontinued (at least temporarily) before pharmacotherapy is initiated. | I                   | NHBPEP, 1993     | Prevent or reduce medication side effects.                                | Clinical trials have associated many drugs with hypertension. The JNC V recommends discontinuation of the implicated drugs to determine if they are causing hypertension. Drugs known to cause hypertension include: oral contraceptives, steroids, nasal decongestants, appetite suppressants, cyclosporine, monamine oxidase inhibitors, tricyclic antidepressants, and erythropoietin. |</p>
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Quality of Evidence</th>
<th>Literature</th>
<th>Benefits</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Initial laboratory tests should include at least 5 of the following: • Urinalysis; • Serum, plasma, or blood glucose; • Serum potassium; • Serum creatinine; • Serum cholesterol; or • Serum triglyceride.</td>
<td>III</td>
<td>NHBPEP, 1993</td>
<td>Reduce or eliminate medication side effects. Prevent other symptoms from the underlying disease (e.g., renal failure from renal artery stenosis). Decrease synergistic risk of cardiovascular complications. Prevent hypertensive complications.</td>
<td>No clinical trials directly examine the efficacy of initial laboratory testing for hypertensive patients. These minimum recommendations from JNC V search for secondary causes, other cardiac risk factors, and end organ damage.</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>7. First-line treatment for Stage 1-2 hypertension is lifestyle modification. The medical record should indicate counseling for at least 1 of the following interventions prior to initiating pharmacotherapy: • weight reduction if obese; • increased physical activity if sedentary; • low sodium diet, or • alcohol intake reduction if alcohol drinker.</td>
<td>I-II</td>
<td>Schotte and Stunkard, 1990; Langford, 1991; Blair et al., 1984; Cutler et al., 1991; Maheswaran et al., 1991</td>
<td>Avoid side effects of medical therapy. Decreases hypertensive complications.</td>
<td>Cohort data from 301 obese patients showed weight loss reduces blood pressure, and a randomized trial of 878 obese patients showed that weight loss enhances antihypertensive pharmacotherapy. A meta-analysis of 23 randomized trials showed that lowering dietary sodium lowers blood pressure. Cohort observational data indicates that sedentary patients develop hypertension more frequently. A randomized trial showed that advising alcoholics to reduce their drinking reduced their blood pressure.</td>
</tr>
<tr>
<td>Indicator</td>
<td>Quality of Evidence</td>
<td>Literature</td>
<td>Benefits</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>8. First-line treatment for Stage 3 hypertension is lifestyle modification. The medical record should indicate counseling for at least 1 of the following interventions: • weight reduction if obese; • increased physical activity if sedentary; • low sodium diet, or • alcohol intake reduction if alcohol drinker.</td>
<td>I-II</td>
<td>Schotte and Stunkard, 1990; Langford, 1991; Blair et al., 1984; Cutler et al., 1991; Maheswaran et al., 1991</td>
<td>Avoid side effects of medical therapy. Decreases hypertensive complications.</td>
<td>Cohort data from 301 obese patients showed weight loss reduces blood pressure and a randomized trial of 878 obese patients showed that weight loss enhances antihypertensive pharmacotherapy. A meta-analysis of 23 randomized trials showed that lowering dietary sodium lowers blood pressure. Cohort observational data indicate that sedentary patients develop hypertension more frequently. A randomized trial showed that advising alcoholics to reduce their drinking reduced their blood pressure.</td>
</tr>
<tr>
<td>9. Stage 1-2 hypertensives whose blood pressure remains Stage 1-2 after 6 months lifestyle modification should receive pharmacotherapy, if not already on it.</td>
<td>I</td>
<td>Collins, 1990; Hebert, 1988; JNC V, 1993</td>
<td>Decrease hypertensive complications.</td>
<td>A meta-analysis of 14 randomized trials using pharmacotherapy in hypertension showed a 42% reduction in stroke, a 14% reduction in coronary heart disease, and a 12% reduction in mortality.</td>
</tr>
<tr>
<td>10. Stage 3 hypertensives should receive pharmacotherapy.</td>
<td>I</td>
<td>Collins, 1990; Hebert, 1988; JNC V, 1993</td>
<td>Decrease hypertensive complications.</td>
<td>A meta-analysis of 14 randomized trials using pharmacotherapy in hypertension showed a 42% reduction in stroke, a 14% reduction in coronary heart disease, and a 12% reduction in mortality.</td>
</tr>
<tr>
<td>11. First-line pharmacotherapy for diabetics should include an ACE inhibitor, a calcium channel blocker, or a thiazide diuretic.</td>
<td>I</td>
<td>Lederle, 1992; Baba, 1987; Bjorck, 1986; Marre, 1988; Hommel, 1986; Curb, 1996</td>
<td>Decrease hypertensive complications (particularly nephropathy).</td>
<td>Randomized trials have shown these agents to reduce progression of proteinuria and diabetic nephropathy.</td>
</tr>
<tr>
<td>Follow-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Hypertensive patients should visit the provider at least once each year.</td>
<td>III</td>
<td>NHBPEP, 1993</td>
<td>Reduce hypertensive complications and medication side effects.</td>
<td>JNC V recommends twice each year, but original panel changed to once.</td>
</tr>
</tbody>
</table>

**References:**
- I Collins, 1990; Hebert, 1988; JNC V, 1993
- II Schotte and Stunkard, 1990; Langford, 1991; Blair et al., 1984; Cutler et al., 1991; Maheswaran et al., 1991
- III NHBPEP, 1993
13. Hypertensive patients with consistent average SBP>160 or DBP>90 over 6 months should have one of the following interventions recorded in the medical record:

- Change in dose or regimen of antihypertensives; or
- Repeated education regarding lifestyle modifications

| III | NHBPEP, 1993 | Decrease hypertensive complications. | JNC V recommendations. |

Definitions and Examples

1. Hypertensive complications include: Cardiovascular disease, cerebrovascular disease, retinopathy and nephropathy. Cardiovascular disease can result in chest pain, shortness of breath, claudication, fatigue, and death. Cerebrovascular disease can result in neurologic symptoms (e.g., aphasia, paralysis) and death. Retinopathy can result in visual field defects and blindness. Nephropathy can result in edema, arrhythmias, nausea, vomiting, fatigue, dialysis, and death.

2. Drugs known to cause hypertension include: oral contraceptives, steroids, nasal decongestants, appetite suppressants, cyclosporine, monamine oxidase inhibitors, tricyclic antidepressants, and erythropoietin.

NOTE: Stages 1-4 hypertension are defined as listed below. See Table 11.1 for the complete high blood pressure diagnostic staging system.

<table>
<thead>
<tr>
<th>Stage of Hypertension</th>
<th>Systolic (mm Hg)</th>
<th>Diastolic (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1 (mild)</td>
<td>140-159</td>
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<td>Stage 2 (moderate)</td>
<td>160-179</td>
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<tr>
<td>Stage 3 (severe)</td>
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<td>110-119</td>
</tr>
<tr>
<td>Stage 4 (very severe)</td>
<td>&gt;210</td>
<td>&gt;120</td>
</tr>
</tbody>
</table>

Quality of Evidence Codes

I  RCT
II-1 Nonrandomized controlled trials
II-2 Cohort or case analysis
II-3 Multiple time series
III Opinions or descriptive studies