



# City Health Information

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## MANAGEMENT OF HYPERTENSION IN ADULTS

- Recommend healthy lifestyle changes, including increased physical activity and a low-sodium diet, for all patients with hypertension and pre-hypertension.
- Prescribe thiazide diuretics as the initial drug of choice for most patients.
- Aim for target blood pressure of <140/90 for most hypertensive patients and <130/80 for those with diabetes or kidney disease.

Uncontrolled hypertension is a leading cause of preventable heart attack, stroke and death. The risk of death from cardiovascular disease and stroke begins to rise at levels as low as 115/75, and doubles with each increase of 20 mm Hg systolic or 10 mm Hg diastolic blood pressure.<sup>1</sup>

Hypertension affects 1 in 3 adults in the U.S. – about 30% of whom are undiagnosed.<sup>2</sup> Nearly a third of black New Yorkers report high blood pressure, compared with 22% of whites. Death rates from hypertension are more than 3 times higher in New York City’s poorest neighborhoods than in the wealthiest.<sup>3</sup>

Control of blood pressure is achievable in nearly all patients, yet 70% of people with hypertension nationwide do NOT have blood pressure under optimal control.<sup>2</sup>

Anti-hypertensive drugs are safe and effective, and cut the risk of heart attack by up to 25%, stroke by about 40%, and heart failure by half. Yet more than one third of New Yorkers who report high blood pressure also say they do not take blood pressure-lowering medications.<sup>4</sup>

This issue highlights key points in the prevention, detection, evaluation, and treatment of hypertension.

### Identify Hypertension and Pre-Hypertension

#### Classifying Blood Pressure Levels

As it has become clearer that even mild elevations in blood pressure increase the risk of cardiovascular disease and stroke, classifications have changed and treatment thresholds are lower (*Table 1*).

**TABLE 1. CLASSIFICATION OF BLOOD PRESSURE LEVELS FOR PEOPLE 18 AND OLDER\***

	Systolic BP (mm Hg)		Diastolic BP (mm Hg)
Normal	<120	AND	<80
Pre-Hypertension**	120 to 139	OR	80 to 89
Stage 1 Hypertension	140 to 159	OR	90 to 99
Stage 2 Hypertension	≥160	OR	≥100

\* Based on the average of 2 or more correctly measured, seated readings taken on each of 2 or more office visits

\*\* New category introduced in JNC-7 Report

Adapted from: JNC-7, National Heart, Lung, and Blood Institute<sup>5</sup>

### Measure Blood Pressure Accurately

- Measurements are most accurate when patients avoid exercise, caffeine, and smoking for at least 30 minutes in advance.
- Patients should be seated quietly for at least 5 minutes on a chair (not an exam table), with feet on the floor and arm supported at heart level.
- Use an appropriate-sized cuff. A “standard” cuff today is too small for a third of patients.<sup>6</sup> Cuffs that are too small may cause false elevated readings.<sup>7</sup>
- Confirm an elevated reading by measuring blood pressure in the opposite arm.
- Record the average of 2 readings taken at least 1 minute apart.<sup>8</sup>

### Goals of Therapy

- **For patients with “pre-hypertension”** (a new category in JNC-7), the goal is normal blood pressure (<120/80) through healthy lifestyle modifications (*Table 2*). Medication is usually not recommended for these persons.
- **For most patients with hypertension**, the treatment goal is <140/90.
- **For those with diabetes or kidney disease** (conditions that compound the cardiovascular risks of hypertension), the treatment goal is <130/80.
- For a step-by-step approach to effective management of hypertension, see the decision flowchart (*Figure 1*).

### Help Patients ‘Know Their Numbers’

Provide blood pressure results to all patients, both verbally and in writing. Help them use the New York City Department of Health and Mental Hygiene’s personal health record, *Passport to Your Health*, to track blood pressure results and goals along with other important preventive care. (To order passports and other free

patient-education materials and tools, including a daily and weekly blood pressure tracker for patient self-monitoring, call 311 or see **Resources**.)

### Evaluating Patients

Clinical evaluation of patients with hypertension (*Table 3*) has several objectives, all of which affect treatment:

- To assess lifestyle and other cardiovascular risk factors that affect prognosis or complicate care.
- To reveal identifiable causes of high blood pressure.
- To identify target organ damage and cardiovascular disease.

### Secondary Hypertension

Further evaluation is indicated when secondary hypertension – hypertension caused by an underlying, potentially treatable disorder – is suspected (*Table 4*).

Consider secondary hypertension when:

- The clinical evaluation suggests it.
- The patient is young, with no obvious cause of hypertension.
- Onset is sudden.
- High blood pressure does not respond (or stops responding) to medical treatment.<sup>5</sup>

### Managing Hypertension and Pre-Hypertension

Aim for target blood pressure described under **Goals of Therapy**.

### Healthy Lifestyle Changes Should Be First-Line Therapy for All Patients

Pre-hypertension can usually be treated with lifestyle modifications alone.

**TABLE 2. LIFESTYLE MODIFICATIONS TO MANAGE HYPERTENSION AND PRE-HYPERTENSION\***

Key Modifications	Recommended Actions	Approximate Systolic BP Reduction
<b>Physical activity</b>	<ul style="list-style-type: none"> <li>• Get at least 30 minutes of moderate-to-vigorous activity (such as a brisk walk) at least 4 days/week.</li> </ul>	4 – 9 mm Hg
<b>Healthy diet</b>	<ul style="list-style-type: none"> <li>• Eat plenty of fruits and vegetables, low-fat dairy products, whole grains, fish, lean poultry, and nuts – a diet low in saturated, trans, and total fat.</li> <li>• Reduce sodium intake to no more than 100 mmol/day (about 2.4 g sodium or 6 g sodium chloride).</li> <li>• Maintain adequate dietary potassium: more than 90 mmol (3,500 mg) a day<sup>5</sup>.</li> </ul>	8 – 14 mm Hg  2 – 8 mm Hg  2 – 4 mm Hg
<b>Weight reduction</b>	<ul style="list-style-type: none"> <li>• Maintain a healthy weight; keep body mass index &lt; 25 (for someone 5'10", &lt; 175 pounds; for someone 5'4", &lt; 146 pounds).</li> </ul>	5 – 20 mm Hg per 22 lbs weight loss
<b>Alcohol consumption</b>	<ul style="list-style-type: none"> <li>• Limit to no more than:               <ul style="list-style-type: none"> <li>• 2 drinks/day for most men</li> <li>• 1 drink/day for women and lighter weight persons</li> </ul>               (One drink = 12 oz beer, 5 oz wine, or 1.5 oz spirits)             </li> </ul>	2 – 4 mm Hg

\* For overall cardiovascular risk reduction, always recommend smoking cessation: see Treating Nicotine Addiction. *City Health Information*. 2005 24(4):21-28. Available at: [www.nyc.gov/html/doh/downloads/pdf/chi/chi21-6.pdf](http://www.nyc.gov/html/doh/downloads/pdf/chi/chi21-6.pdf).  
Adapted with modifications from: JNC-7, National Heart, Lung, and Blood Institute<sup>5</sup>

For patients with hypertension, healthy lifestyle modifications are critical to reduce blood pressure, enhance effectiveness of anti-hypertensive drugs, and reduce cardiovascular disease risk. Lifestyle modifications are standard-of-care for all patients with hypertension – whether or not they take medication (*Table 2*).

**Patients with hypertension who adopt healthy lifestyle changes to lower their blood pressure are 6 times more likely to have their blood pressure controlled than those who don't make changes.<sup>9</sup>**

## Pharmacologic Treatment

### *Diuretics Are the Cornerstone*

Often underused, thiazide diuretics should be initial therapy for most patients with hypertension, either alone or in combination with other drug classes (*Tables 5, 6*). Diuretics increase the effectiveness of multi-drug anti-hypertensive regimens – a significant benefit, since most patients need 2 or more anti-hypertensive drugs to achieve their blood pressure goal. And they are low cost. Increasing appropriate use of diuretics would significantly improve blood pressure control in many patients.

### TABLE 3. CLINICAL EVALUATION OF PATIENTS WITH HIGH BLOOD PRESSURE

#### SCREEN FOR LIFESTYLE BEHAVIORS THAT CONTRIBUTE TO ELEVATED BLOOD PRESSURE

- Alcohol use
- Physical inactivity
- Use of cocaine, amphetamines, or other illicit drugs
- Diet high in sodium and saturated and trans fat, low in fruits, vegetables, and whole grains

#### REVIEW FOR MEDICATIONS AND OTHER AGENTS THAT CAN ELEVATE BLOOD PRESSURE

- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Some anti-depressants (e.g., venlafexine)
- Sibutramine
- Oral contraceptives
- Cortisone and other adrenal steroid hormones
- Cyclosporine and tacrolimus
- Licorice, some chewing tobacco
- Cyclooxygenase 2 (COX-2) inhibitors
- Sympathomimetics (e.g., decongestants and some non-prescription weight loss drugs)
- Erythropoietin
- Over-the-counter dietary supplements such as ephedra, ma huang, bitter orange

#### CONDUCT PHYSICAL EXAMINATION

- Body mass index
- Optic fundi
- Auscultation for carotid, abdominal, and femoral bruits
- Thyroid gland
- Heart and lungs
- Abdomen for enlarged kidneys, masses, abnormal aortic pulsation
- Lower extremity edema and pulses
- Neurologic assessment

#### PERFORM LABORATORY TESTS AND ROUTINE STUDIES

- Electrocardiogram
- Fasting blood glucose
- Serum potassium
- Fasting lipid profile: total cholesterol, HDL, LDL, and triglycerides
- Urinalysis
- Hematocrit
- Serum creatinine (or GFR)

### TABLE 4. CAUSES OF SECONDARY HYPERTENSION

Causes	Diagnostic Tests
• Medication associated with hypertension	• If possible, trial discontinuation or alternative agent
• Polycystic kidney disease	• Abdominal ultrasound
• Glomerulonephritis	• Bun/creatinine; urinalysis; imaging studies
• Obstructive uropathy	• Ultrasound; CT; cystoscopy
• Renovascular disease	• Doppler flow study; magnetic resonance angiography
• Pheochromocytoma	• History; 24-hour urinary metanephrines or normetanephrines, and plasma metanephrines
• Cushing's syndrome	• History; dexamethasone suppression test
• Primary aldosteronism	• 24-hr urinary aldosterone level; plasma rennin
• Thyroid disease	• Thyroid-stimulating hormone
• Parathyroid disease	• Serum PTH/calcium level
• Coarctation of aorta	• CT angiography
• Drug induced	• History; drug screen
• Sleep apnea	• Sleep study

Although thiazides may worsen glucose tolerance and are associated with the onset of new diabetes, this has not been shown to increase cardiovascular risk. Patients taking diuretics should be monitored for onset of new diabetes, especially those with elevated fasting glucose; aggressively treated for known diabetes risk factors, such as obesity; and maintained at the lowest effective thiazide dose.

### ***‘Compelling Indications’: High-Risk Conditions Call for the Use of Certain Drugs***

Some patients with hypertension have high-risk conditions that create compelling indications for certain anti-hypertensive drug classes. These conditions include cardiovascular disease, diabetes, and kidney disease (*Table 5*).

**TABLE 5. SELECTING FIRST-LINE ANTI-HYPERTENSIVE DRUGS\***

	<b>Medication Options**</b>	<b>Comments</b>
<b>Most Patients</b>	<b>THIAZ</b> diuretics Alone or combined w/other drugs	If <b>THIAZ</b> contraindicated or not well-tolerated, try ACE-I, BB, ARB, or CCB.
<b>Patients With Compelling Indications</b>		
<b>Coronary disease</b> (confirmed or suspected)	<b>BB, ACE-I, CCB, THIAZ</b>	If using a CCB, select a non-dihydropyridine. Consider aspirin and provide aggressive lipid management.
<b>Post-myocardial infarction</b>	<b>BB, ACE-I</b>	Consider aspirin and provide aggressive lipid management.
<b>Heart failure – systolic</b> (low output)	<b>ACE-I or ARB, BB, ALDO, THIAZ</b>	ACE-I, BB, and ALDO are associated with improved survival in systolic heart failure.
<b>Heart failure – diastolic</b> (abnormal left ventricular filling)	<b>ACE-I or ARB, BB, THIAZ</b>	ACE-I, ARB and BB improve ventricular relaxation and decrease stiffness. BB reduces heart rate to improve diastolic filling. Monitor response to THIAZ closely as patients may be pre-load dependent.
<b>Diabetes</b>	<b>ACE-I or ARB, THIAZ, BB, CCB</b>	ACE-I and ARB have a reno-protective effect in addition to favorable blood pressure-lowering properties. Goal: < 130/80 mm Hg
<b>Kidney disease</b>	<b>ACE-I or ARB</b>	ACE-I and ARB have a reno-protective effect in addition to favorable blood pressure-lowering properties. Goal: < 130/80 mm Hg
<b>Cerebrovascular disease</b> (non-acute)	THIAZ, ACE-I	See AHA/ASA guidelines for evaluation of CVD risk in stroke patients.

#### **Drug Abbreviations**

**ACE-I** Angiotensin-Converting Enzyme Inhibitor  
**ARB** Angiotensin Receptor Blocker  
**ALDO** Aldosterone Antagonist

**BB** Beta Blocker  
**CCB** Calcium Channel Blocker  
**THIAZ** Thiazide Diuretic

\* For detailed information on the use of antihypertensive agents, see expert recommendations, including American College of Cardiology/American Heart Association guidelines, available at [www.acc.org](http://www.acc.org).

\*\* **Drugs listed in bold are recommended first-line drugs.**

Adapted with modifications from: JNC-7, National Heart, Lung, and Blood Institute<sup>5</sup>

**TABLE 6. SELECTED ANTI-HYPERTENSIVE MEDICATIONS: DOSAGE, COST, AND SERIOUS ADVERSE EFFECTS**

<b>Drug Class</b>	<b>Generic Name</b> Common Trade Name	<b>Daily Dosage<sup>a</sup></b>	<b>Cost</b> Generic (Trade)	<b>Serious Adverse Effects<sup>d</sup></b> (For complete list, see citation below)
<b>Diuretic:</b> Thiazide	<b>Hydrochlorothiazide</b> Microzide <sup>®</sup>	12.5 – 50 mg	<b>\$2.40<sup>c</sup></b> (18.90) <sup>c</sup>	Hyperuricemia; hypokalemia; hypomagnesemia; hyperglycemia; hypercalcemia; sexual dysfunction (men); rashes and other allergic reactions; photosensitivity reactions
	<b>Chlorothiazide</b> Diuril <sup>®</sup>	125 – 500 mg in 1 or 2 doses	<b>6.00<sup>b</sup></b> (7.20) <sup>b</sup>	
	<b>Chlorthalidone</b>	12.5 – 50 mg	<b>6.90<sup>c</sup></b>	
<b>Diuretic:</b> Loop	<b>Furosemide</b> Lasix <sup>®</sup>	20 – 320 mg in 2 or 3 doses	<b>5.10<sup>b</sup></b> (8.40) <sup>b</sup>	Dehydration; circulatory collapse; hypokalemia; hyponatremia; hypomagnesemia; hyperglycemia; metabolic alkalosis; hyperuricemia; blood dyscrasias; rashes
	<b>Bumetanide</b> Bumex <sup>®</sup>	0.5 – 5 mg in 2 or 3 doses	<b>9.00<sup>b</sup></b> (13.80) <sup>b</sup>	
	<b>Torsemide</b> Demadex <sup>®</sup>	5 – 20 mg in 1 or 2 doses	<b>18.20<sup>b</sup></b> (22.20) <sup>b</sup>	
<b>Diuretic:</b> Potassium Sparing	<b>Spironolactone</b> Aldactone <sup>®</sup>	12.5 – 100 mg in 1 or 2 doses	<b>11.40<sup>b</sup></b> (18.30) <sup>b</sup>	<b>Spironolactone:</b> hyperkalemia; hyponatremia; mastodynia; gynecomastia; menstrual abnormalities; GI disturbance; rash <b>Amiloride:</b> hyperkalemia; GI disturbance; rash; headache
	<b>Amiloride</b> Midamor <sup>®</sup>	5 – 10 mg in 1 or 2 doses	<b>14.10<sup>b</sup></b> (18.00) <sup>b</sup>	
	<b>Triamterene</b> Dyrenium	60 – 150 mg in 1 or 2 doses	<b>NA</b> (29.70) <sup>b</sup>	
<b>Angiotensin- Converting Enzyme Inhibitors</b>	<b>Benazepril</b> Lotensin <sup>®</sup>	10 – 80 mg in 1 or 2 doses	<b>22.20<sup>c</sup></b> (32.70) <sup>c</sup>	Cough; hypotension; rash; acute renal failure if used in bilateral renal artery stenosis; angioedema; hyperkalemia; mild-to-moderate loss of taste; hepatotoxicity; pancreatitis; blood dyscrasias; increased fetal mortality with second and third trimester exposure
	<b>Captopril</b> Capoten <sup>®</sup>	12.5 – 150 mg in 2 or 3 doses	<b>18.90<sup>c</sup></b> (35.70) <sup>c</sup>	
	<b>Enalapril</b> Vasotec <sup>®</sup>	2.5 – 40 mg in 1 to 2 doses	<b>19.80<sup>c</sup></b> (26.40) <sup>c</sup>	
	<b>Lisinopril</b> Prinivil <sup>®</sup> Zestril <sup>®</sup>	5 – 40 mg in 1 dose	<b>21.90<sup>c</sup></b> (30.00) <sup>c</sup> (32.10) <sup>c</sup>	
	<b>Fosinopril</b> Monopril <sup>®</sup>	10 – 80 mg in 1 or 2 doses	<b>28.50<sup>c</sup></b> (39.30) <sup>c</sup>	
	<b>Quinapril</b> Accupril <sup>®</sup>	5 – 80 mg in 1 or 2 doses	<b>N/A</b> (37.50) <sup>c</sup>	
	<b>Ramipril</b> Altace <sup>®</sup>	1.25 – 20 mg in 1 or 2 doses	<b>N/A</b> (32.70) <sup>c</sup>	
<b>Angiotensin- Receptor Blockers</b>	<b>Candesartan</b> Atacand <sup>®</sup>	8 – 32 mg in 1 dose	<b>N/A</b> (44.40) <sup>c</sup>	Similar to ACE inhibitors but do not cause cough and rarely cause angioedema; loss of taste; hepatic dysfunction
	<b>Irbesartan</b> Avapro <sup>®</sup>	150 – 300 mg in 1 dose	<b>N/A</b> (46.80) <sup>c</sup>	
	<b>Losartan</b> Cozaar <sup>®</sup>	25 – 100 mg in 1 or 2 doses	<b>N/A</b> (45.90) <sup>c</sup>	
	<b>Telmisartan</b> Micardis <sup>®</sup>	40 – 80 mg in 1 dose	<b>N/A</b> (47.70) <sup>c</sup>	
	<b>Valsartan</b> Diovan <sup>®</sup>	80 – 320 mg in 1 dose	<b>N/A</b> (48.60) <sup>c</sup>	

a. Recommended dosage may be lower for patients taking another anti-hypertensive medication. In the elderly, initiate treatment with low dose, titrate upward with frequent visits, and monitor **closely** for adverse effects.

b. Treatment guidelines from *The Medical Letter* February 2003, financial data from October 2002: cost for 30 days' treatment with lowest dose.

c. Treatment Guidelines from *The Medical Letter* July 2004, financial data from May 2004: cost for 30 days' treatment with lowest dose.

d. In addition to the adverse effects listed, anti-hypertensive medications may interact with medications taken concurrently (*Medical Letter Handbook of Adverse Drug Interactions*, 2003).

**TABLE 6. SELECTED ANTI-HYPERTENSIVE MEDICATIONS: DOSAGE, COST, AND SERIOUS ADVERSE EFFECTS (continued)**

<b>Drug Class</b>	<b>Generic Name</b> Common Trade Name	<b>Daily Dosage<sup>a</sup></b>	<b>Cost</b> Generic (Trade)	<b>Serious Adverse Effects<sup>d</sup></b>
<b>Beta-Adrenergic Blocking Drugs</b>	<b>Metoprolol</b> Lopressor <sup>®</sup> Toprol XL <sup>®</sup>	50 – 200 mg in 1 or 2 doses	<b>\$8.70<sup>b</sup></b> (25.20) <sup>b</sup> (22.20) <sup>b</sup>	Fatigue; depression; bradycardia; impotence; decreased exercise tolerance; congestive heart failure; worsening of peripheral arterial insufficiency; bronchospasm; may aggravate allergic reactions; may mask signs of hypoglycemia; insomnia; hallucinations; acute mental disorder; increase in serum triglycerides; decreased HDL cholesterol; sudden withdrawal may lead to exacerbation of angina and myocardial infarction  Caution in use with non-dihydropyridine calcium channel blockers
	<b>Atenolol</b> Tenormin <sup>®</sup>	25 – 100 mg in 1 or 2 doses	<b>9.60<sup>b</sup></b> (35.40) <sup>b</sup>	
	<b>Propranolol</b> Inderal <sup>®</sup>	40 mg – 240 mg in 2 doses	<b>10.60<sup>b</sup></b> (18.60) <sup>b</sup>	
	<b>Propranolol extended release</b> Inderal LA <sup>®</sup>	60 – 240 mg in 1 dose	<b>23.70<sup>b</sup></b> (36.00) <sup>b</sup>	
	<b>Labetalol</b> Normodyne <sup>®</sup> Trandate <sup>®</sup>	200 – 1200 mg in 2 doses	<b>24.00<sup>b</sup></b> (37.20) <sup>b</sup> (26.40) <sup>b</sup>	
	<b>Carvedilol</b> Coreg <sup>®</sup>	12.5 – 50 mg in 2 doses	<b>N/A</b> (88.00) <sup>b</sup>	
	<b>Bisoprolol</b> Zebeta	5 – 20 mg in 1 dose	<b>33.90<sup>c</sup></b> (40.20) <sup>b</sup>	
<b>Calcium Channel Blockers:</b> Non-Dihydropyridines	<b>Diltiazem extended release</b> Cardizem CD <sup>®</sup>	120 – 360 mg in 1 dose	<b>30.30<sup>c</sup></b> (40.60) <sup>b</sup>	Dizziness; headache; edema; constipation; AV block; bradycardia; heart failure; lupus-like rash with diltiazem  Caution in use with beta-blocker
	<b>Verapamil extended release</b>	120 – 480 mg in 1 or 2 doses	<b>25.50<sup>c</sup></b>	
<b>Calcium Channel Blockers:</b> Dihydropyridines	<b>Amlodipine</b> Norvasc <sup>®</sup>	2.5 – 10 mg in 1 dose	<b>N/A</b> (45.60) <sup>c</sup>	Dizziness; headache; peripheral edema; flushing; rash; tachycardia; gingival hyperplasia
	<b>Nicardipine</b> Cardene SR <sup>®</sup>	60 – 120 mg in 2 or 3 doses	<b>32.40<sup>b</sup></b> (54.60) <sup>c</sup>	
	<b>Nifedipine extended release</b> Procardia XL <sup>®</sup>	30 – 90 mg in 1 dose	<b>30.90<sup>c</sup></b> (43.80) <sup>b</sup>	
<b>Combination Drugs</b>	<b>Hydrochlorothiazide</b> 25 or 50mg/ <b>Triamterene</b> 37.5, 50 or 75mg Dyazide <sup>®</sup>	1 tablet per day	<b>10.80<sup>b</sup></b>  (16.80) <sup>b</sup>	See individual drug components
	<b>Captopril</b> 25 or 50 mg/ <b>Hydrochlorothiazide</b> 15 or 25mg Capozide <sup>®</sup>	1 tablet per day	<b>15.00<sup>b</sup></b>  (35.40) <sup>b</sup>	
	<b>Lisinopril</b> 10 or 20mg/ <b>Hydrochlorothiazide</b> 12.5 or 25 mg Prinzide <sup>®</sup>	1 tablet per day	<b>N/A</b>  (35.70) <sup>b</sup>	
	<b>Bisoprolol</b> 2.5, 5 or 19mg/ <b>Hydrochlorothiazide</b> 6.25 mg Ziac <sup>®</sup>	1 tablet per day	<b>29.40<sup>b</sup></b>  (39.30) <sup>b</sup>	

## Next Steps

Expect a single drug at standard dosage to lower systolic blood pressure by a mean of about 9 mm Hg – more if the patient’s baseline blood pressure was high (i.e., Stage 2).<sup>10</sup> Start all hypertensive medications at the lowest recommended dose. Common adverse effects, such as the metabolic complications of thiazides, are usually dose-related; the one important exception is the cough associated with angiotensin-converting enzyme inhibitors (ACE-Is). Optimize dosages and/or add additional drugs as needed. Check potassium and creatinine at least once or twice a year.

### To help patients get blood pressure under control:

- Schedule appointments with clinical support staff to measure blood pressure between physician visits.
- Encourage self-monitoring.

Failure to control hypertension occurs primarily because of inadequate clinical management and patient non-adherence (*Table 7*). Patient adherence can be quickly assessed by asking: “*Have you ever missed a single dose?*”<sup>11</sup>

## Special Considerations

### Black Patients

Because salt sensitivity is more common among blacks than whites, low-sodium diets may be particularly effective in lowering blood pressure in this population. A thiazide diuretic will usually be the initial drug of choice (as it is for other groups). While calcium channel blockers (CCBs) lower blood pressure, there is evidence of higher rates of congestive heart failure among black patients taking CCBs as first-line therapy.<sup>16</sup> Also, ACE-I-induced angioedema is more common in blacks.<sup>17</sup> Do not avoid using these drugs when indicated, but monitor closely.

**TABLE 7. FACTORS CONTRIBUTING TO UNCONTROLLED HYPERTENSION AND SUGGESTED ACTIONS**

Contributing Factor	Suggested Action
<p><b>Clinical Management</b> Physicians miss many opportunities to improve blood pressure control by not adjusting medications at office visits.<sup>12</sup></p>	Monitor patients closely and adjust medication as needed to reach treatment goals.
<p><b>Patient Adherence</b> <b>Complexity of Regimens</b> Patient adherence drops as the number of prescribed medications (and daily doses) rises.<sup>13</sup></p>	Simplify regimens. Use once-daily dosing whenever possible.
<p><b>Drug Cost</b> Some patients skip doses because they can’t afford the medication – and most won’t talk about it unless the doctor broaches the subject. Non-white patients are only half as likely as white patients to talk to their provider about their plans to under-use a medication because of drug cost.<sup>14</sup></p>	Ask patients about cost concerns. Prescribe generics when possible and offer information on drug discount programs (see <b>Resources</b> ).
<p><b>Adverse Effects</b> Almost one third of patients stop taking anti-hypertensive medication because of adverse effects.<sup>15</sup></p>	Discuss common adverse effects and encourage patients to report symptoms.

## Patients with Diabetes

Clinicians should be aggressive in controlling hypertension in patients with diabetes. The treatment goal is <math><130/80\text{ mm Hg}</math>.<sup>5</sup>

ACE-Is and angiotensin II receptor blockers (ARBs) protect renal function and are good first-line choices for people with diabetes, although ARBs are not yet available in generic form. Further, ACE-Is decrease the risk of cardiovascular events in patients with diabetes. People with diabetes who take beta-blockers are more likely to gain weight than those on other agents;<sup>18</sup> however, beta-blockers should be used in patients with known coronary artery disease.

## Older Patients

In people 50 and older, systolic blood pressure is a stronger predictor of cardiovascular disease than diastolic blood pressure.<sup>19</sup> Elevated systolic blood pressure should therefore be treated even when diastolic blood pressure is normal. Monitor pulse pressure (systolic minus diastolic), as a widened pulse pressure may indicate underlying disease and is associated with increased risk of heart failure, stroke, and other car-

diovascular events. Monitor older patients closely, assess carefully for cardiovascular disease, and aggressively treat other modifiable risk factors.

Lower initial drug doses are appropriate for older patients. Start at a low dose, such as 12.5 mg hydrochlorothiazide; titrate upward during frequent visits; and monitor closely for adverse effects.

## Patients Who Are Pregnant

For pregnant women with hypertension, ACE-Is and ARBs are contraindicated. Medication options and the choice of first-line drugs should be carefully considered for these patients. Generally, labetalol and methyldopa should be first-line treatment for chronic hypertension. If these are contraindicated, consider vasodilators.<sup>20</sup>

For women with low cardiovascular risk, treatment with medication for uncomplicated Stage 1 hypertension is not shown to improve perinatal outcomes. For cases of new-onset hypertension after the 20th week of pregnancy, immediately refer the patient to her obstetrician for evaluation (*see Resources*).<sup>20</sup>

## PATIENT SELF-MONITORING

Patient self-monitoring of blood pressure with a home blood pressure monitoring device can be key to managing hypertension. Out-of-office measurements may be better predictors of cardiovascular risk and organ damage than office readings.<sup>21,22</sup> Self-monitoring may also improve blood pressure control.<sup>23</sup> It may be used to titrate medications effectively, and to screen for white coat hypertension. Self-monitoring may help make an asymptomatic disease more apparent to patients, thereby increasing their motivation and involvement in disease management.

Provide your patients with advice on how to select a validated blood pressure monitor, and check the accuracy of the monitor by comparing it with your office equipment. Be sure patients understand their blood pressure goals, know how to respond to unusually high or low readings, and bring in records of readings for your review.

The mid-range price of a home monitor in NYC pharmacies is about \$60. Monitors are not covered by most insurance plans.

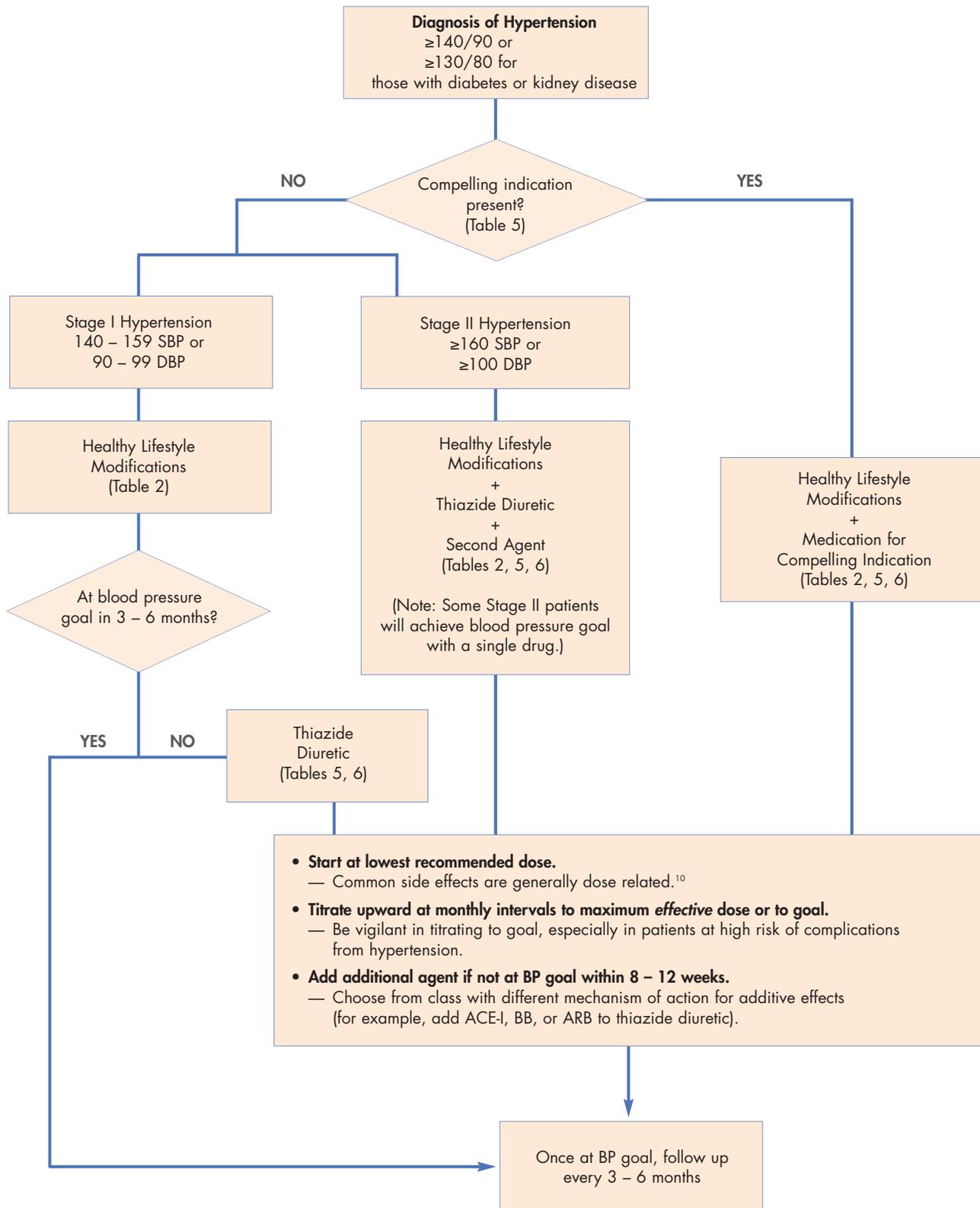
To assist patients in keeping track of blood pressure taken outside of the office, call 311 and ask for the Blood Pressure Tracking Card.

## Patients Who Smoke

The risk of a cardiovascular event significantly increases in patients with hypertension who also smoke. Smoking, even in the absence of other medical

conditions, doubles the risk of heart disease.<sup>24</sup> Brief counseling, combined with pharmacotherapy, can result in quit rates of up to 30% – far higher than unassisted quit rates (*see Resources*).

**FIGURE 1. DECISION FLOW CHART FOR TREATING HYPERTENSION**



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## RESOURCES

### Patient Information

- **NYC DOHMH *Healthy Heart Blood Pressure Health Bulletin***  
In English, Spanish and Chinese  
[www.nyc.gov/html/doh/html/pub/pub.shtml?y=alert](http://www.nyc.gov/html/doh/html/pub/pub.shtml?y=alert)
- **Harlem and South Bronx Fitness Resource Directories**  
[www.nyc.gov/html/doh/html/cdp/cdp-obesity.shtml](http://www.nyc.gov/html/doh/html/cdp/cdp-obesity.shtml)
- **U.S. Department of Health and Human Services/National Institutes of Health**  
*Your Guide to Lowering Blood Pressure*  
[www.nhlbi.nih.gov/health/public/heart/hbp/hbp\\_low/index.htm](http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp_low/index.htm)  
Patient Interactive Web site:  
[www.nhlbi.nih.gov/hbp/index.html](http://www.nhlbi.nih.gov/hbp/index.html)
- **American Heart Association**  
Information on hypertension:  
[www.americanheart.org/presenter.jhtml?identifier=2112](http://www.americanheart.org/presenter.jhtml?identifier=2112)  
Information on medication adverse effects:  
[www.americanheart.org/presenter.jhtml?identifier=2112](http://www.americanheart.org/presenter.jhtml?identifier=2112)  
Information on diabetes (in Spanish):  
<http://www.americanheart.org/presenter.jhtml?identifier=3018643>
- **NOAH New York Online Access to Health**  
Bilingual (Spanish and English) online patient resources  
[www.noah-health.org/](http://www.noah-health.org/)  
Hypertension specific <http://www.noah-health.org/en/blood/hypertension/what/index.html>
- **Easy-to-use patient CVD risk calculator with risk reduction education**  
[www.yourdiseaserisk.harvard.edu](http://www.yourdiseaserisk.harvard.edu)
- **Drug assistance programs for patients**  
RxOutreach 1-800-769-3880. Application can be accessed through [www.rxoutreach.com](http://www.rxoutreach.com)  
EPIC <http://www.health.state.ny.us/nysdoh/epic/faq.htm>  
(for those 65 years and older)

### Provider Information

- **New York City Department of Health and Mental Hygiene**  
*Take Care New York: A Policy for a Healthier New York City*  
[www.nyc.gov/html/doh/pdf/chi/chi23-3.pdf](http://www.nyc.gov/html/doh/pdf/chi/chi23-3.pdf)
- **Medline Plus**  
A variety of resources for physicians is available at:  
[www.nlm.nih.gov/medlineplus/highbloodpressure.html](http://www.nlm.nih.gov/medlineplus/highbloodpressure.html)
- **National Heart, Lung, and Blood Institute**  
Download slideshow of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7)  
[http://hin.nhlbi.nih.gov/nhbpep\\_slds/jnc/jncp5\\_1.htm](http://hin.nhlbi.nih.gov/nhbpep_slds/jnc/jncp5_1.htm)
- **e-Clinician**  
Offers access to valuable CME qualifying webcasts and a wide range of downloads for your PDA free of charge, including JNC-7 Guidelines.  
[www.eClinician.org](http://www.eClinician.org)
- **Motivational Interviewing Techniques for Physicians**  
Introduction  
<http://www.motivationalinterview.org/clinical/whatismi.html>  
User-friendly provider handbook "Lifestyle Change" by Chris Dunn and Stephen Rollnick
- **Agency for Healthcare Research and Quality Evidence-Based Guidelines**  
[http://www.guideline.gov/summary/summary.aspx?view\\_id=1&doc\\_id=3978](http://www.guideline.gov/summary/summary.aspx?view_id=1&doc_id=3978)
- **Counseling techniques, including quit tips for patients and pharmacotherapy options**, can be found in *Treating Nicotine Addiction*. *City Health Information*. 2005 24(4):21-28,  
<http://www.nyc.gov/html/doh/downloads/pdf/chi/chi21-6.pdf> or by calling 311

For an e-mail subscription to *City Health Information*: visit: [www.nyc.gov/html/doh/html/chi/chi.shtml](http://www.nyc.gov/html/doh/html/chi/chi.shtml)



# City Health Information

October 2005 The New York City Department of Health and Mental Hygiene Vol. 24(7):39-50



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## CME Activity – Management of Hypertension in Adults

**1. Which of the following lifestyle modifications are known to be effective in controlling hypertension? (Check one.)**

- A.** Eat a healthy diet rich in fruits, vegetables, and low-fat dairy products, and reduce salt intake.
- B.** Maintain a healthy body weight.
- C.** Engage in moderate-to-vigorous physical activity for 30 minutes per day, 4 days per week.
- D.** All of the above.

**2. A 38-year-old woman with diabetes is newly diagnosed with hypertension. She has no known coronary artery disease. In addition to counseling for lifestyle modification, which one of the following drugs is a recommended first-line choice?**

- A.** Captopril
- B.** Amlodipine
- C.** Diltiazem
- D.** Labetalol

**3. A 47-year-old man has a blood pressure of 138/88 mmHg (his pressure was 130/80 on his last office visit). He has no other medical problems. Which of the following should you prescribe for the patient?**

- A.** Chlorothiazide
- B.** Enalapril
- C.** Lifestyle modifications (weight management, heart-healthy diet, physical activity)
- D.** Methyldopa

**4. A 33-year-old woman newly diagnosed with hypertension has a blood pressure of 149/98. She has diabetes. All of the following are true EXCEPT:**

- A.** A clinical evaluation is indicated to assess lifestyle, identify cardiovascular risk factors, reveal identifiable causes of high blood pressure, and identify target organ damage and cardiovascular disease.
- B.** Her goal blood pressure is <140/80.
- C.** Recommend healthy lifestyle modifications.
- D.** An ACE-I is an appropriate first-line choice of medication.

**5. Which of the following is true about patient self-monitoring of blood pressure?**

- A.** It may help improve blood pressure control.
- B.** It may predict cardiovascular disease risk better than office readings.
- C.** It may improve patient adherence with therapy.
- D.** All of the above.

**6. How well did this continuing education activity achieve its educational objectives?**

- A.** Very well
- B.** Adequately
- C.** Poorly

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## Continuing Education Activity

This issue of *City Health Information*, including the continuing education activity, can be downloaded from the publications section at [nyc.gov/health](http://nyc.gov/health). To access *City Health Information* and Continuing Medical Education online, visit [www.nyc.gov/html/doh/html/chi/chi.shtml](http://www.nyc.gov/html/doh/html/chi/chi.shtml).

### Instructions

Read this issue of *City Health Information* for the correct answers to questions. To receive continuing education credit, you must answer 4 of the first 5 questions correctly.

### To Submit by Mail

1. Complete all information on the response card, including your name, degree, mailing address, telephone number, and e-mail address. PLEASE PRINT LEGIBLY.
2. Select your answers to the questions and check the corresponding boxes on the response card.
3. Return the response card (or a photocopy) postmarked **no later than October 31, 2006**. Mail to:

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125 Worth Street, CN-29C, New York, NY 10213-2188.

### To Submit Online

Visit [www.nyc.gov/html/doh/html/chi/chi.html](http://www.nyc.gov/html/doh/html/chi/chi.html) to complete this activity online. Your responses will be graded immediately, and you can print out your certificate.

## Continuing Education Activity Management of Hypertension in Adults

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CITY HEALTH INFORMATION  
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### Objectives

At the conclusion of the course, the participants should be able to:

1. Identify and manage pre-hypertension and hypertension.
2. Counsel patients in lifestyle modification.
3. Prescribe medications appropriately when required, especially in patients with co-morbidities such as diabetes, coronary heart disease, and chronic kidney disease.
4. Recognize factors contributing to poorly controlled hypertension and be able to apply suggested actions to overcome them.

### Accreditation

The DOHMH is accredited by the Medical Society of the State of New York to sponsor continuing medical education for physicians. This continuing medical education activity is designated for a maximum of 1.5 hours in Category One credit toward the AMA/PRA (Physician's Recognition Award). Each physician should claim only those hours of credit that were spent on the educational activity.

Participants are required to submit name, address, and professional degree. This information will be maintained in the Department's CME program database. If you request, the CME Program will verify your participation and whether you passed the exam.

We will not share information with other organizations without your permission, except in certain emergencies when communication with health care providers is deemed by the public health agencies to be essential or when required by law. Participants who provide e-mail addresses may receive electronic announcements from the Department about future CME activities as well as other public health information.

**Participants must submit the accompanying exam by October 31, 2006.**

#### CME Activity Faculty:

Sonia Angell, MD MPH ; Lynn Silver, MD MPH ;  
Mary Bassett, MD MPH

All faculty are affiliated with the New York City DOHMH, Division of Health Promotion and Disease Prevention.

The faculty does not have any financial arrangements or affiliations with any commercial entities whose products, research, or services may be discussed in this issue.



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