REVIEW

CME CREDIT

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Treat high blood pressure sooner: Tougher, simpler JNC 7 guidelines

KEY POINTS

After age 50, high systolic blood pressure (> 140 mm Hg) is much more important than high diastolic pressure as a risk factor for cardiovascular events.

People who are normotensive at age 55 still have a 90% lifetime risk for developing hypertension.

People with a systolic blood pressure of 120 to 139 mm Hg or a diastolic pressure of 80 to 89 mm Hg should be considered prehypertensive and should undertake health-promoting lifestyle modifications to prevent cardiovascular disease.

Thiazide-type diuretics should be used to treat most patients with uncomplicated hypertension, either alone or combined with drugs from other classes, but certain high-risk conditions constitute compelling indications for the initial use of other types of antihypertensive drugs.

Most patients with hypertension need two or more antihypertensive medications to achieve their goal pressure (< 140/90 mm Hg or < 130/80 mm Hg for patients with diabetes or chronic kidney disease).

If blood pressure is more than 20/10 mm Hg above goal, one should consider starting therapy with two agents, one of which usually should be a thiazide-type diuretic.

Motivation improves when patients have positive experiences with and trust in the clinician. Empathy builds trust and is a potent motivator.

IN 2003, a blood pressure of 120/80 mm Hg isn't normal anymore—it's *prehypertensive*.

This is perhaps the most startling news from the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7),[1] the latest consensus report from the National High Blood Pressure Education Program of the National Heart, Lung, and Blood Institute.

The JNC 7 report is designed, even more than its predecessors, to convey a strong message to the nation's physicians: high blood pressure must be taken seriously. It is being published in two parts, a concise practical guide, published in the May 21, 2003, issue of JAMA and available online at **www.nhlbi.nih.gov/guidelines/hypertension,**[1] and a more comprehensive report in the future that will provide a broader discussion and justification for the recommendations.

A strong and simple message was needed. Rates of detection, treatment, and control of high blood pressure have improved in the past decade, but not by much. In the latest National Health and Nutrition Examination Survey (1999–2000), only 34% of hypertensive people had their pressure at goal levels, compared with 27% in the 1991–1994 survey.[1] We need to do better.

Thus, the classification system for blood pressure has been simplified (**TABLE 1**), as has the algorithm for treating hypertension (**FIGURE 1**). And if half of the population (those with blood pressure 120/80 mm Hg or higher) is classified as either hypertensive or prehypertensive, the intent is not to frighten or to label, but to educate people to adopt a healthy lifestyle in order to prevent hypertension in the first place.

TABLE 1

Classification and management of blood pressure for adults aged 18 years or older

CLASSIFICATION	SYSTOLIC (MM HG)*	DIASTOLIC (MM HG)*	MANAGEMENT*		
			LIFESTYLE MODIFICATION	INITIAL DRUG THERAPY	
				WITHOUT COMPELLING INDICATIONS	WITH COMPELLING INDICATIONS†
Normal	< 120	*and* < 80	Encourage		
Prehypertension	120–139	*or* 80–89	Yes	No antihypertensive drug indicated	Drug(s) for the compelling indications‡
Stage 1 hypertension	140–159	*or* 90–99	Yes	Thiazide-type diuretics for most; may consider ACE inhibitor, ARB, beta-blocker, calcium channel blocker, or combination	Drug(s) for the compelling indications Other antihypertensive drugs (diuretics, ACE inhibitor, ARB, beta-blocker, calcium channel blocker) as needed
Stage 2 hypertension	≥ 160	*or* ≥ 100	Yes	Two-drug combination for most (usually thiazide-type diuretic and ACE inhibitor or ARB or beta-blocker or calcium channel blocker)§	Drug(s) for the compelling indications Other antihypertensive drugs (diuretics, ACE inhibitor, ARB, beta-blocker, calcium channel blocker) as needed

ACE = angiotensin-converting enzyme, ARB =. angiotensin-receptor blocker
*Treatment determined by highest blood pressure category
†Heart failure, postmyocardial infarction, high coronary disease risk, diabetes, chronic kidney disease, recurrent stroke prevention; see **TABLE 2**
‡Treat patients with chronic kidney disease or diabetes to blood pressure goal of less than 130/80 mm Hg
§Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension

FROM CHOBANIAN AV, BAKRIS GL, BLACK HR, ET AL AND THE NATIONAL HIGH BLOOD PRESSURE EDUCATION PROGRAM COORDINATING COMMITTEE. THE SEVENTH REPORT OF THE JOINT NATIONAL COMMITTEE ON PREVENTION, DETECTION, EVALUATION, AND TREATMENT OF HIGH BLOOD PRESSURE. THE JNC 7 REPORT. JAMA 2003; 289:2560–2572.

A SIMPLER CLASSIFICATION SYSTEM AND ALGORITHM

In the previous JNC report (JNC 6, published in 1997),[2] there were six categories of blood pressure: optimal, normal, high-normal, and stage 1, stage 2, and stage 3 hypertension. The JNC 6 system further subdivided the high-normal and hypertensive groups into three risk groups according to the presence or absence of target organ disease (eg, left ventricular hypertrophy) and risk factors (eg, diabetes).

In this system, both the blood pressure and the risk group affected treatment decisions. For example, patients with stage 1 hypertension (systolic pressure 140–159 mm Hg or diastolic pressure 90–99 mm Hg) who were in risk group A (no risk factors, no target organ disease) could undergo a trial of lifestyle modifications for up to 12 months to see if this would lower their blood pressure to goal levels. Those with stage 1 hypertension in risk group B (at least 1 risk factor not including diabetes; no target organ disease) could undergo lifestyle modifications for up to 6 months.

The JNC 7 committee felt that this system was too complicated, for a number of reasons. For example, risk group A (no risk factors) included only premenopausal women—male gender and postmenopausal status were defined as risk factors. Furthermore, there was little value in distinguishing stage 2 hypertension from stage 3, as the treatment was the same for both stages. Moreover, the committee was concerned that the old category of "high-normal" blood pressure (130/85–139/89 mm Hg) led to complacency among patients and did not adequately alert them to their risk

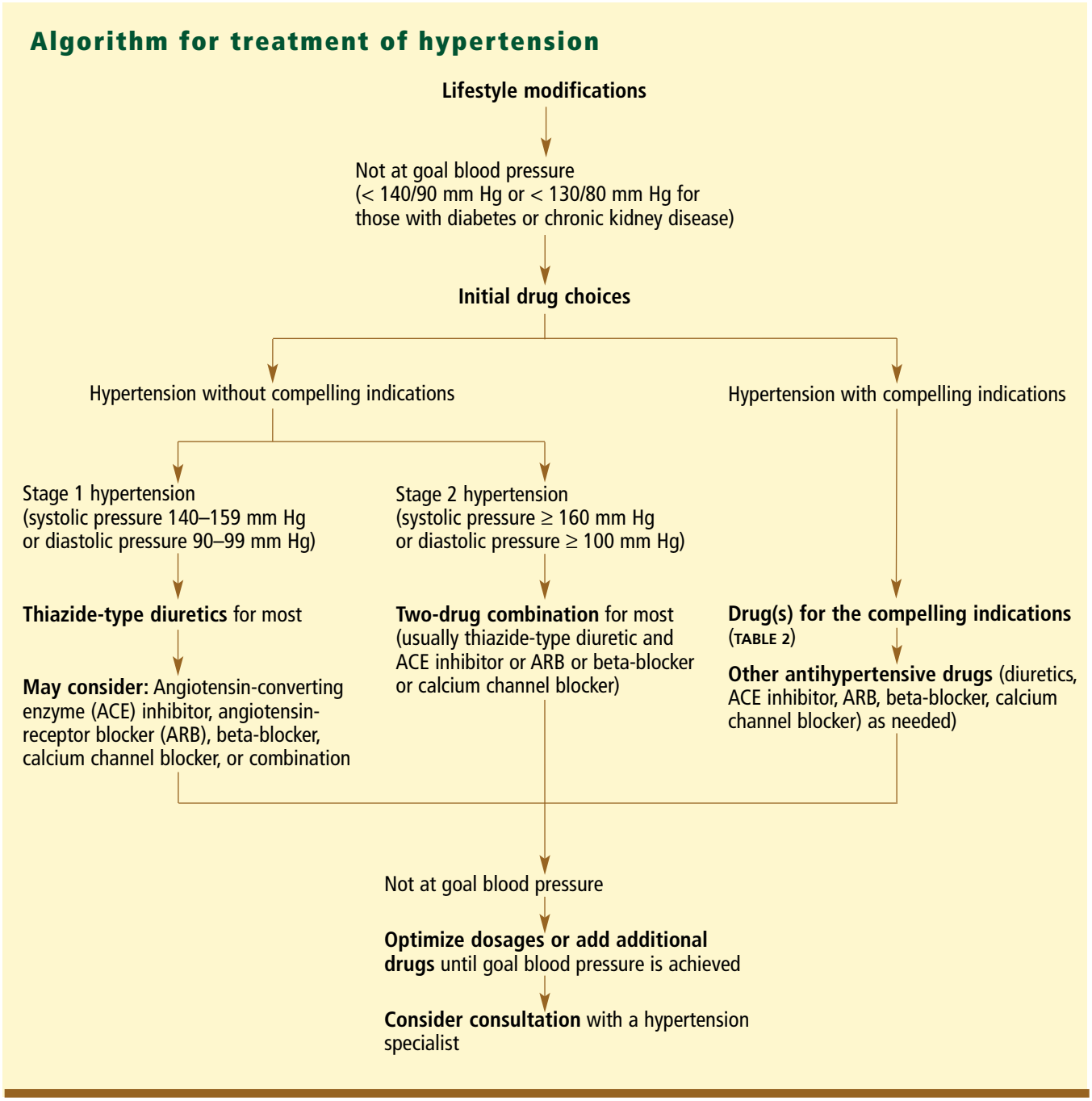

FIGURE 1

FROM CHOBANIAN AV, BAKRIS GL, BLACK HR, ET AL AND THE NATIONAL HIGH BLOOD PRESSURE EDUCATION PROGRAM COORDINATING COMMITTEE. THE SEVENTH REPORT OF THE JOINT NATIONAL COMMITTEE ON PREVENTION, DETECTION, EVALUATION, AND TREATMENT OF HIGH BLOOD PRESSURE. THE JNC 7 REPORT. JAMA 2003; 289:2560–2572.

of becoming hypertensive (see Point 3, below).

Therefore, the new JNC 7 report dramatically simplifies the classification system: there are only four blood pressure categories and no risk groups (TABLE 1). Unlike in JNC 6, all patients with stage 1 hypertension (systolic pressure 140–159 mm Hg or diastolic pressure 90–99 mg Hg) should be immediately started on antihypertensive drug therapy after undergoing appropriate evaluation (TABLE 2).

TABLE 2

Evaluation of patients with high blood pressure

Goals

To detect major cardiovascular risk factors
- Hypertension
- Smoking
- Obesity (body mass index ≥ 30)
- Physical inactivity
- Dyslipidemia
- Diabetes mellitus
- Microalbuminuria or estimated glomerular filtration rate < 60 mL/minute
- Age > 55 years (men) or > 65 years (women)
- Family history of premature cardiovascular disease (< 55 years in men or < 65 years in women)

To detect target-organ damage
- Left ventricular hypertrophy
- Angina or prior myocardial infarction
- Prior coronary revascularization
- Heart failure
- Stroke or transient ischemic attack
- Chronic kidney disease
- Peripheral arterial disease
- Retinopathy

To detect identifiable causes of hypertension
- Sleep apnea
- Drugs
- Chronic kidney disease
- Primary aldosteronism
- Renovascular disease
- Chronic steroid therapy and Cushing syndrome
- Pheochromocytoma
- Coarctation of the aorta
- Thyroid or parathyroid disease

Physical examination
- Measure blood pressure (two readings in both arms on two separate occasions)
- Examine optic fundi
- Calculate body mass index
- Auscultate for carotid, abdominal, and femoral bruits
- Palpate the thyroid gland
- Examine the heart and lungs thoroughly
- Examine the abdomen for enlarged kidneys, masses, and abnormal aortic pulsation
- Palpate the lower extremities for edema and pulses
- Assess neurologic status

Laboratory and other tests
- Electrocardiography
- Urinalysis
- Blood glucose
- Hematocrit
- Serum potassium
- Serum creatinine (or estimated glomerular filtration rate)
- Serum calcium
- Lipid profile (after fasting 9–12 hours)
  - High-density lipoprotein cholesterol
  - Low-density lipoprotein cholesterol
  - Total cholesterol
  - Triglycerides
- Urinary albumin excretion or albumin/creatinine ratio (optional)

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Thus, the treatment algorithm based on these blood pressure stages is simpler (FIGURE 1). No longer do physicians have to both calculate the blood pressure stage and add up various risk factors. Now, any patient in stage 1 should be immediately started on one drug, while patients in stage 2 should immediately begin combination therapy.

SEVEN POINTS

The JNC 7 report listed seven key points, which we will review.

Point 1: Don't ignore systolic hypertension

After age 50, high systolic blood pressure (ie, > 140 mm Hg) is much more important than high diastolic pressure as a cardiovascular risk factor.[3] In 12-year follow-up data from more than 316,000 men who were screened for the Multiple Risk Factor Intervention Trial (MRFIT),[4] the risk of death from coronary heart disease was almost linearly related to systolic blood pressure at all levels of diastolic pressure, whereas the opposite was not true: for men with systolic pressure higher than 160 mm Hg, the risk was actually lower if their diastolic pressure was greater than 100 mm Hg than if it was less than 70 mm Hg. The investigators concluded that systolic pressure is a stronger risk factor than diastolic.

Yet when high blood pressure is inade-

quately controlled—as it is in 66% of people with high blood pressure—the systolic pressure is more likely to be above the goal level than the diastolic. Physicians are more likely to ignore an elevated systolic reading than an elevated diastolic reading.[5]

The reasons for this not-so-benign neglect are partly historic: the first JNC report,[6] published in 1977, did not include systolic pressure in its recommendations. Also, high systolic pressure is so common among older patients that it may seem "normal." And systolic pressure is harder to control than diastolic pressure.

Yet, randomized studies have shown that controlling elevated systolic pressure is possible and will reduce cardiovascular events.[7,8] If control rates and cardiovascular outcomes are to improve, we must remember to "think systolic."

Point 2: Most older patients will become hypertensive

Nearly all of us will eventually become hypertensive if we live long enough. Even people who are normotensive at age 55 have a 90% lifetime risk for developing hypertension, according to Framingham data.[9]

Framingham data also show that people with blood pressure between 130/85 and 139/89 mm Hg ("high-normal" in the classification system used by the World Health Organization) have a 37.3% likelihood of developing sustained hypertension within 4 years if they are younger than 65 years, and 49.5% if they are older. In contrast, the rate for people with blood pressure lower than 120/80 ("optimal") is 5.3% in the younger group and 16.0% in the older group.[10]

Point 3: Prehypertension begets hypertension: Think prevention

For people 40 to 70 years old, the risk of cardiovascular disease doubles with each increment of 20/10 mm Hg above 115/75 mm Hg.[11] Further, as noted above, the chance of developing hypertension is greater if your blood pressure is higher to begin with. Therefore, people with a systolic blood pressure of 120 to 139 mm Hg or a diastolic pressure of 80 to 89 mm Hg are now considered prehypertensive.

These people might be able to delay or prevent the onset of hypertension by undertaking selected healthy lifestyle modifications. Known benefits of lifestyle modifications are to:

- Lower blood pressure
- Enhance the effectiveness of antihypertensive drugs
- Decrease cardiovascular risk.

Therefore, patients who are prehypertensive should be encouraged (and those who are hypertensive should be *told*) to:

Lose weight. A normal body weight is defined as a body mass index of 18.5 to 24.9. A 10-kg weight loss is associated with a systolic blood pressure reduction of 5 to 20 mm Hg.[12,13]

Eat more fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat, such as in The Dietary Approaches to Stop Hypertension (DASH) diet.[14] Systolic reduction: 8–14 mm Hg.[14,15]

Reduce dietary sodium intake to no more than 2.4 g sodium or 6 g sodium chloride (about 1 tsp of table salt). Systolic reduction: 2–8 mm Hg.[14–16]

Exercise. Regular aerobic physical activity such as brisk walking at least 30 minutes per day, most days of the week, can reduce systolic pressure by 4 to 9 mm Hg.[17,18]

Consume alcohol only in moderation. Most men should have no more than two drinks per day (1 ounce or 30 mL ethanol, which is contained in 24 ounces of beer, 10 ounces of wine, or 3 ounces of 80-proof whiskey). Women and lighter-weight persons should drink no more than half that amount. Reducing alcohol intake to this level reduces systolic pressure by 2–4 mm Hg.[19]

Lifestyle modification is part of treatment for all patients with hypertension

Point 4: Use thiazides

Most patients with uncomplicated hypertension should receive a thiazide diuretic, either alone or combined with drugs from other classes.

Thiazide-type diuretics have been the basis of antihypertensive therapy in most outcome trials.[20] Moreover, they seem to be comparable to or better than the other classes of drugs for many patients.

Two trials, two conclusions?

Two recent major trials compared the outcomes of patients randomly assigned to

TABLE 3

Compelling indications for individual drug classes

COMPELLING INDICATION	RECOMMENDED DRUGS					
	DIURETIC	BETA-BLOCKER	ACE INHIBITOR	ANGIOTENSIN-RECEPTOR BLOCKER	CALCIUM CHANNEL BLOCKER	ALDOSTERONE ANTAGONIST
Heart failure	•	•	•	•		•
Postmyocardial infarction		•	•			•
High coronary disease risk	•	•	•		•	
Diabetes	•	•	•	•	•	
Chronic kidney disease			•	•		
Recurrent stroke prevention	•		•			

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Thiazide diuretics seem to be the best choice for most patients

receive diuretics vs other classes of antihypertensive drugs: the Antihypertensive and Lipid-Lowering to Prevent Heart Attack Trial (ALLHAT)[21] and the Second Australian National Blood Pressure trial.[22]

At first glance, the trials seemed to come to different conclusions. In ALLHAT, the thiazide-type diuretic chlorthalidone was at least equivalent to the other drugs tested in all the outcomes measured and was better in some, notably heart failure. In contrast, in the Australian trial, men had slightly better outcomes with a regimen that began with an angiotensin-converting enzyme (ACE) inhibitor than with one starting with a diuretic. The drugs produced equivalent outcomes in women.

On closer inspection, however, the findings of the two trials may actually be compatible, and any differences may be explained by differences in the study designs and patient populations.

Whereas ALLHAT was a randomized, double-blind study, the Australian study, although randomized, was open-label. The open-label design may have led to reporting bias, especially for events that might have been expected to be less common in the ACE inhibitor group, such as myocardial infarction or congestive heart failure. Furthermore, ALLHAT was much bigger than the Australian study, with a correspondingly greater statistical power.

In addition, ALLHAT focused on a high-risk group: all of the participants had at least one risk factor other than hypertension. Half had known atherosclerotic cardiovascular disease, and 36% had diabetes. African Americans accounted for 35% of the cohort, and the mean body mass index was nearly 30. The mean age was 67 years. In contrast, the Australian patients, although older (mean age 72 years), were a lower-risk group. Only 8% had known coronary artery disease, and 7% had diabetes. There were few if any black people, and the mean body mass index was 27.

A complete discussion of this issue is beyond the scope of this article but will be addressed in a future article in this journal.

Compelling indications for other drug classes

Certain conditions, such as renal disease and recent myocardial infarction, are compelling indications for the initial use of nonthiazide antihypertensive drug classes, which may have additional actions other than lowering blood pressure (TABLE 3). If a drug is not tolerated or is contraindicated, then a drug from an alternative class proven to reduce cardiovascular events should be used instead.

Point 5: Most patients will need more than one medication

Most patients with hypertension will need at least two antihypertensive medications to achieve their blood pressure goals (< 140/90 mm Hg for most patients, or < 130/80 for patients with diabetes or diabetes or renal disease).

Fifty-four percent of patients with isolated systolic hypertension in the Systolic Hypertension in the Elderly Program (SHEP)[8] and 40% of patients in the Systolic Hypertension in Europe (Syst-Eur)[9] study needed more than one drug, even though the target systolic blood pressures in these studies were considerably higher than the currently recommended goal of 140 mm Hg.

In the Hypertension Optimal Treatment (HOT) trial,[23] most patients required two or more agents to achieve the aggressive diastolic blood pressure goals established for this study (ie, either < 90, < 85, or < 80 mm Hg).

A second drug from a different class should be added when use of a single drug in adequate doses fails to achieve the blood pressure goal. For most patients, one of the drugs should be a thiazide diuretic, which boosts the effects of other classes of drugs.

Point 6: For some patients with higher pressure, start with two drugs

If the patient's blood pressure is higher than the goal pressure by more than 20 mm Hg systolic or 10 mm Hg diastolic, one should consider starting therapy with two agents, one of which should be a thiazide-type diuretic.

The rationale is pragmatic: many patients who are started on single agents never achieve optimal control because their dosage is never adjusted upward or a second drug is never added. However, caution is advised in patients at risk of orthostatic hypotension, eg, those with diabetes or autonomic dysfunction or who are very old.

Point 7: Work with the patient to build compliance

For therapy to work, the patient has to be motivated enough to follow a healthy lifestyle and to take his or her medication as prescribed.

The JNC 7 report states: "Motivation improves when patients have positive experiences with and trust in their clinicians. Empathy builds trust and is a potent motivator."

To build empathy, trust, and motivation, physicians should:

- Try to understand the patient's attitudes, culture, beliefs, and previous experiences with the health care system. In particular, what are his or her concerns and fears about therapy?
- Make sure the patient understands and agrees with the goals of therapy. In particular, one should provide the patient, verbally and in writing, his or her blood pressure numbers and goals.
- Remove barriers to care. Barriers can include cost of the medications and complexity of care. Fortunately, the best drugs for most patients—the thiazide diuretics—are also the cheapest.

A FINAL POINT

The JNC 7 report is based on scientific evidence; nevertheless, guidelines are only guidelines. The JNC 7 Committee emphasizes that the responsible physician's judgment is paramount in managing his or her patients.

Give the patient his or her blood pressure numbers and goals verbally and in writing

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