CME CREDIT

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Managing hypertension in the elderly: dispelling the myths

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■ **BACKGROUND** There are now more than 31 million people 65 years of age or older in the United States, at least half of whom have systolic blood pressure 140 mm Hg or higher or diastolic blood pressure 90 mm Hg or higher or both. By the year 2050, 16 million Americans will be over age 85.

■ **OBJECTIVE** To review the current data and recommendations regarding treating hypertension in elderly patients.

■ **SUMMARY** Randomized clinical trials have dispelled some of the myths that surround treatment of hypertension in the elderly by showing that judicious treatment of elevated blood pressure, both systolic and diastolic, will reduce the risk of cardiovascular morbidity and mortality, with an acceptable trade-off in terms of side effects and without sacrificing quality of life.

■ **CONCLUSIONS** Because most of the trials have used a diuretic as initial therapy, it is recommended that one of these agents be prescribed in low doses if life-style modifications do not reduce blood pressure to acceptable levels, unless there is a contraindication to diuretics or an indication for another class of agents.

■ INDEX TERMS: HYPERTENSION; AGED; DIURETICS
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NEW INFORMATION generated by randomized clinical trials has done much to dispel the myths about treating hypertension in the elderly. It is now apparent that the risks of cardiovascular morbidity and mortality can be reduced in elderly patients by appropriate treatment of diastolic as well as isolated systolic hypertension.

PREVALENCE AND CARDIOVASCULAR RISK

Because of the prevalence of hypertension and the rapidly growing number of elderly patients in this country, hypertension in the aging population is an enormous public health problem.[1] An estimated 31.2 million people in United States are age 65 or older, and more than half of them have hypertension, ie, systolic blood pressure (SBP) ≥ 140 mm Hg, or diastolic blood pressure (DBP) ≥ 90 mm Hg, or both (*Table 1*).

The prevalence of isolated systolic hypertension (defined as SBP ≥ 140 and DBP < 90 mm Hg) increases with age. Nearly 75% of hypertensive patients age 75 or older have isolated systolic hypertension, compared with only 60% of hyper-

TABLE 1
TRENDS IN PREVALENCE OF HYPERTENSION IN PEOPLE AGE 65 TO 74*

Sex and ethnic group	Prevalence of hypertension (%)† 1976–1980	1988–1991
Women	67.5	52.5
African Americans	82.9	71.9‡
Whites	66.2	51.2‡
Mexican Americans	—	53.1
Men	60.2	56.4
African Americans	67.1	71.6‡
Whites	59.2	54.9‡
Mexican Americans	—	56.9
Totals§	64.3	54.3
African Americans	76.1	71.8‡
Whites	63.1	52.9‡
Mexican Americans	—	54.9

*From the National High Blood Pressure Education Program, reference 1, based on data from the second and third National Health and Nutrition Examination Surveys and the Hispanic Health and Nutrition Examination Survey
†Defined as the average of three measurements on a single occasion of 140 mm Hg or greater (systolic) or 90 mm Hg or greater (diastolic) or both or taking antihypertensive medication
‡Non-Hispanics
§Totals include racial and ethnic groups not shown separately

tensive patients age 60 to 74.[1] In contrast, most elderly patients with high DBP have primary or essential hypertension that was acquired years ago. The prevalence of hypertension is greater in elderly African Americans than it is in elderly white or Mexican Americans (*Table 1*).

The risk of cardiovascular disease associated with hypertension is greater in elderly people than in younger people,[2] and it is higher for elderly men than for elderly women. SBP appears to predict both coronary heart disease and stroke better than DBP does in elderly patients.[3,4]

Borderline (stage 1) isolated systolic hypertension (SBP 140 to 159 mm Hg and DBP < 90 mm Hg) was the most common type of untreated hypertension among adults over age 60 in the Framingham study. Follow-up studies have shown that it progresses to more severe levels within 10 years in more than half of people who have it and imparts a 40% to 50% higher risk of cardiovascular morbidity and mortality than in normotensive subjects.[5]

EVALUATION

The pretreatment evaluation of most elderly patients with hypertension need not be elaborate. The purposes of the evaluation are to: (1) search for evidence of target-organ disease and other cardiovascular risk factors; (2) confirm that the SBP or DBP is persistently elevated; and (3) uncover clues that the patient may have secondary hypertension.

The history should elicit how long the patient has had hypertension; what previous treatment he or she has received for it (if any); whether there is a family history of hypertension, diabetes, or cardiovascular disease; whether the patient has other risk factors such as cigarette smoking, diabetes, sedentary life-style, and high dietary intake of sodium and saturated fat; and whether he or she has evidence of target-organ disease such as stroke, transient ischemic attack, myocardial infarction, angina pectoris, or renal disease.

The physical examination should be complete, and the examiner should especially search for retinopathy associated with hypertension; cardiac enlargement, arrhythmias, murmurs, and gallops; abdominal masses; aortic aneurysms; abnormal breath sounds; bruits in the neck or abdomen; absent or weak peripheral pulses; and edema in the extremities. Unless there is clinical suspicion of an underlying cause for the hypertension, the laboratory examination should be limited to a urinalysis, an electrocardiogram, a hemogram, and an automated battery of blood tests including creatinine, potassium, glucose, and total and high-density lipoprotein cholesterol.

Clues to secondary hypertension include recent (less than 2 years) onset or exacerbation of diastolic hypertension, acquired resistance to a previously effective antihypertensive regimen, and retinal hemorrhages and exudates with or without papilledema.

Spontaneous (and usually asymptomatic) hypokalemia suggests the possibility of primary aldosteronism. Headache, inappropriate perspiration, palpitations, and tremor occurring paroxysmally, often with very high but labile blood pressure, may be due to pheochromocytoma.

Atherosclerotic renovascular disease is the most common cause of secondary hypertension in elderly patients and is usually responsible for new-onset diastolic hypertension after age 55 or for acquired resistance to treatment. Renovascular disease, pheochromocytoma, and primary aldosteronism rarely if ever cause isolated systolic hypertension. The differential diagnosis of isolated systolic hypertension in an elderly patient includes aortic regurgitation, thy-

TABLE 2
CLINICAL TRIALS IN OLDER PATIENTS WITH HYPERTENSION*

	Australian[16]	EWPHE[15] †	Coope and Warrender[12]	STOP Hypertension[17] ‡	MRC[14] §	SHEP[13] ‖	HDFP[11] ¶
No. of patients	582	840	884	1627	4396	4736	2376
Age range, years	60–69	> 60	60–79	70–84	65–74	≥ 60	60–69
Blood pressure entry criteria, mm Hg:							
Systolic	< 200	160–239	170–280	180–230 or < 180	160–209	160–219	—
Diastolic	95–109	90–119	105–120	90–120 or 105–120	< 115	< 90	≥ 90
Mean blood pressure at entry, mm Hg	165/101	182/101	197/99	195/102	185/91	170/77	170/101
Blood pressure goal, mm Hg:							
Systolic	—	—	< 170	< 160	≤ 160 or ≤150#	< 160 or 20 ↓	—
Diastolic	< 90, then < 80	< 90	< 105	< 95	—	—	≤ 90 and > 10 ↓
Treatment:							
Initial	Chlorothiazide	Hydrochlorothiazide + triamterene	Atenolol	Hydrochlorothiazide + amiloride; or atenolol or metoprolol or pindolol	Hydrochlorothiazide + amiloride; or atenolol	Chlorthalidone	Chlorthalidone
Add on	Various	Methyldopa	Bendrofluazide, methyldopa	Atenolol or metoprolol or pindolol; hydrochlorothiazide + amiloride	Atenolol; hydrochlorothiazide	Atenolol	Reserpine or methyldopa; hydralazine; guanethidine

*Adapted from Beard, reference 10; Gifford and Borazanian, reference 9; and the National High Blood Pressure Education Program, reference 1; with permission of the authors and the publishers
†European Working Party on High Blood Pressure in the Elderly
‡Swedish Trial in Old Patients with Hypertension
§Medical Research Council
‖Systolic Hypertension in the Elderly Program
¶Hypertension Detection and Follow-up Program
#If systolic blood pressure was < 180 mm Hg, the goal was ≤ 150 mm Hg; if the systolic blood pressure was ≥ 180 mm Hg, the goal was ≤160 mm Hg.

rotoxicosis, arteriovenous fistulas, and beriberi heart disease, but it is almost always caused by loss of elasticity and compliance in the aorta and large arteries.

Pseudohypertension

Spurious elevations in indirectly measured SBP and DBP can result from severe sclerosis of the brachial artery, requiring excessive pressure in the sphygmomanometer cuff to compress it. This has been referred to as "pseudohypertension." Messerli et al[6] found that 13 of 24 elderly hypertensive patients had a positive Osler's sign (ie, either the brachial or radial artery could definitely be palpated after the artery was occluded by increasing cuff pressures above the SBP) and had indirect (cuff) blood pressure measurements that were 10 to 54 mm Hg higher than direct intra-arterial pressure measurements. However, other investigators have compared indirect measurements with direct arterial measurements and have found close correlations for SBP in patients up to 81 years of age.[7,8] Indirect blood pressure measurements overestimate DBP in all age groups.

Nevertheless, one should consider pseudohypertension when: (1) the blood pressure is elevated out of proportion to the degree of clinical evidence of target organ involvement; (2) the blood pressure

TABLE 3
EFFECTS OF THERAPY IN OLDER PATIENTS WITH HYPERTENSION*

	Australian[16]	EWPHE[15] †	Coope and Warrender[12]	STOP Hypertension[17] ‡	MRC[14] §	SHEP[13] ‖	HDFP[11] ¶
Blood pressure obtained, mm Hg:							
Active treatment group	143/87	149/85	162/77	167/87	152/79	143/68	/81
Placebo group	155/94	172/94	180/88#	186/96	167/85	155/72	/86**
Relative risk:							
Stroke	0.67	0.64	0.58††	0.53††	0.75††	0.67††	0.56††
Coronary artery disease	0.82	0.80	1.03	0.87‡‡	0.81	0.73††	0.85††
Congestive heart failure	—	0.78	0.68	0.49††	—	0.45††	—
All cardiovascular diseases	0.69	0.71††	0.76††	0.60††	0.83††	0.68††	0.84††

*Adapted from Beard, reference 10; Gifford and Borazanian, reference 9; and the National High Blood Pressure Education Program, reference 1; with permission of the authors and the publishers
†European Working Party on High Blood Pressure in the Elderly
‡Swedish Trial in Old Patients with Hypertension
§Medical Research Council
‖Systolic Hypertension in the Elderly Program
¶Hypertension Detection and Follow-up Program; includes data calculated by the HDFP Coordinating Center
#This was an open-label trial that compared a treated group to an untreated group of controls
**This trial compared a stepped-care regimen to referred care at usual sources in the community
††Statistically significant
‡‡Myocardial infarction only; sudden deaths decreased from 13 to 4

fails to respond to an appropriate antihypertensive regimen; or (3) symptoms suggestive of hypotension develop during drug treatment even though the measured blood pressure remains high.

RANDOMIZED CLINICAL TRIALS IN THE ELDERLY

Table 2 lists the important features of seven randomized clinical trials involving elderly patients with hypertension,[1,9,10] and *Table 3* summarizes their results. All showed fewer cardiovascular events in patients randomized to active treatment with diuretics or beta blockers as initial therapy when compared with control patients.[11–17] All these trials were placebo-controlled and blinded except for the Hypertension Detection and Follow-up Program (HDFP),[11] in which participants in the control group were referred to physicians or clinics in the community for care (referred care), and the study of Coope and Warrender,[12] in which the control group did not receive either placebo or antihypertensive therapy.

The Systolic Hypertension in the Elderly Program (SHEP) trial[13] included only patients age 60 or older with isolated systolic hypertension (SBP ≥ 160 mm Hg and DBP < 90 mm Hg). The Medical Research Council (MRC) trial in the elderly[14] included some volunteers with isolated systolic hypertension and some with diastolic hypertension as well, but results were similar for each group.

Treated patients had significantly fewer stroke events than did control patients ($P < .05$) in all but the European Working Party on Hypertension in the Elderly (EWPHE)[15] and Australian[16] trials, and they had significantly fewer coronary events than did control patients in SHEP[13] and HDFP.[11] All but the Australian trial recorded a significantly lower incidence of cardiovascular events in treated patients. In a meta-analysis of six trials in elderly patients with diastolic hypertension, Thijs et al[18] reported a 26% lower incidence of fatal myocardial infarction in the actively treated groups than in the control groups ($P = .004$).

Dispelling the myths

The benefits of treating hypertension (ie, the lower incidence of morbidity and mortality from coronary disease) observed in randomized trials in elderly patients have been more impressive than those observed in younger patients,[19] probably because older patients are at greater risk and therefore will experience more events, making it easier to arrive at statistically significant conclusions during a 3- to 5-year trial. These studies have exploded not only the myth that treating hypertension in the elderly does not prevent heart attacks and strokes, but also the myths that elderly patients do not adhere well to regimens and that they tolerate antihy-

pertensive medications poorly. In HDFP the participants who were ages 60 to 69 at the beginning of the trial had no more adverse effects[20] and were just as adherent,[11] if not more so, than younger participants (*Table 4*).

TABLE 4
ADVERSE DRUG REACTIONS AND ADHERENCE TO TREATMENT IN THE ELDERLY AND IN YOUNGER PARTICIPANTS IN THE HYPERTENSION DETECTION AND FOLLOW-UP PROGRAM

	Age at beginning of trial		
	30–49	50–59	60–69
Percent with adverse drug reactions requiring discontinuation of protocol drug(s)[20]	9.6	10.5	7.0
Adherence[11]			
Percent still taking prescribed drugs at 5 years	75	80	80
Percent at or below goal blood pressure at 5 years	59	67	75
Average diastolic blood pressure at 5 years, mm Hg	86	84	81

There have been legitimate concerns that antihypertensive medications might lead to syncope and falling in elderly patients. In the SHEP trial,[13] 12.8% of the participants receiving active treatment complained of "faintness on standing," but so did 10.6% of those receiving placebo. In the active treatment group, 2.2% reported "loss of consciousness/passing out," compared with 1.3% receiving placebo; "falling" was reported by 12.8% of participants receiving active treatment, and by 10.4% receiving placebo, but there was no difference in the number of fractures (2.4% with active treatment, 2% with placebo). Compared with placebo, antihypertensive treatment did not have any significant adverse effect on cognitive function or level of depression in the SHEP trial.[13,21]

Goldstein et al[22] objectively evaluated the cognitive and behavioral function of 690 hypertensive men age 60 or older who received antihypertensive treatment for 6 months to 1 year. Initial treatment consisted of hydrochlorothiazide, either 25 or 50 mg daily; additional agents were added if necessary, including hydralazine, methyldopa, metoprolol, or reserpine. There was no evidence from careful psychologic testing that reducing blood pressure had any adverse effect on cognition or behavioral function, or that there were any differences among the five drugs administered.

Applegate et al[23] found no significant differences in quality of life in 242 hypertensive women age 65 or older who were treated with atenolol, diltiazem, or enalapril for 16 weeks.

The metabolic side effects of diuretics have been minimal in controlled trials in elderly patients. In the SHEP trial[13] the mean serum potassium concentration decreased, from 4.5 mEq/L at baseline to 4.1 mEq/L at the end of 1 year of low-dose chlorthalidone treatment (12.5 to 25 mg/day); there was no change in the placebo group. Neither potassium-sparing diuretics nor potassium supplements were prescribed initially. The mean fasting plasma glucose concentration increased in the actively treated group, from 108 mg/dL at baseline to 115 mg/dL at the end of 1 year, as did the mean serum cholesterol concentration, from 237 to 242 mg/dL (compared with a change from 236 to 237 mg/dL in the placebo group.) The mean serum urate concentration increased from 5.4 to 6.3 mg/dL in the actively treated group, compared with a change from 5.3 to 5.5 mg/dL in the placebo group.

TREATING HYPERTENSION IN THE ELDERLY

Unless the SBP exceeds 190 mm Hg or the DBP exceeds 100 mm Hg, life-style modifications are indicated as initial therapy in the elderly, just as they are in younger patients.[1,24] Applegate et al[25] have reported that weight reduction, sodium restriction, and increased physical activity reduced SBP and DBP within 6 months in a group of elderly (60 to 85 years of age) hypertensive patients by an average of 4.2 mm Hg and 4.9 mm Hg more than a regimen without life-style modifications did. Moderating alcohol intake to no more than 1 oz of ethanol daily should also be advised. Elderly hypertensive patients should be strongly urged to stop smoking to reduce their risk of heart attack, stroke, lung cancer, and chronic obstructive pulmonary disease.

The SHEP trial has provided convincing evidence that treating isolated systolic hypertension reduces the risk of cardiovascular morbidity and mortality.[13] When the SBP was 160 mm Hg or greater, the goal in SHEP was to reduce it to less than 160 mm Hg and at least 20 mm Hg lower than the pretreatment level. Therefore, if the pretreatment SBP was 165 mm Hg, the goal was to reduce it to 145 mm Hg or lower.

Other trials listed in *Table 3* have demonstrated the benefit of reducing DBP when it is 90 mm Hg or higher. The goal for DBP is unclear, but it is safe to reduce it to at least 85 mm Hg; in the HDFP trial, the average DBP in the elderly group at the end of 5 years was 81 mm Hg. Although some authorities are concerned about a J-curve phenomenon (in which the risk of coronary mortality might paradoxically rise if DBP is reduced below a critical level), the average DBP was 68 mm Hg at the end of the 5-year SHEP trial in the actively-treated group, and there was no evidence of a J-curve.

Staessen and colleagues[26] have reported a J-curve for total mortality in the EWPHE trial, but they concluded that this effect was not caused by the drugs used because it was also observed in the placebo group. Patients in the lowest tertile of SBP and DBP had decreases in body weight and hemoglobin concentrations and an excess in the noncardiovascular mortality rate, suggesting a deterioration in overall health status.

Mann[27] suggested that elderly hypertensive patients require drug treatment only if they have a high risk of cardiovascular disease and if life-style modifications do not reduce blood pressure to desired levels. However, age itself is a potent risk factor that justifies prescribing antihypertensive drugs for most elderly patients whose SBP exceeds 140 mm Hg or whose DBP exceeds 90 mm Hg in spite of a nonpharmacologic regimen. Although there are no randomized trials to show that treating stage 1 or borderline isolated systolic hypertension (SBP 140 to 159 mm Hg, DBP < 90 mm Hg) reduces cardiovascular morbidity or mortality, Sagie et al[5] reported that this condition increases the risk of cardiovascular disease and frequently progresses to more severe hypertension. The goal should be to reduce SBP to less than 140 mm Hg and DBP to 85 mm Hg or less.

The benefit of pharmacologic therapy has been demonstrated for patients in their 80s.[13,17]

Which drug?

The fifth report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure[24] and the Working Group Report on Hypertension in the Elderly[1] both indicate that all classes of drugs are effective in treating hypertension in older patients, but only the diuretics have been shown consistently to reduce cardiovascular morbidity and mortality in this age group in randomized trials (*Tables 2* and *3*). Consequently, a diuretic is the drug of choice unless there is a contraindication to it or unless there is an indication for another class of drug.[24,28] For example, a beta blocker or calcium antagonist would be preferred for a patient with angina pectoris; a beta blocker without intrinsic sympathomimetic activity would offer a cardioprotective effect after a myocardial infarction; and an angiotensin-converting enzyme inhibitor would be preferred for a patient with congestive heart failure due to systolic dysfunction. In all of these examples, a diuretic could be used as adjunctive therapy.

In the Veterans Administration trial of single-drug therapy for hypertension in men, diltiazem and hydrochlorothiazide were the most effective drugs for older black men, while clonidine, atenolol, and diltiazem were the most effective drugs for older white men.[29]

Perry et al[30] found in a double-blind trial that atenolol, enalapril, and isradipine were equally effective in reducing blood pressure for women age 60 to 80 with diastolic hypertension. The frequency of side effects was approximately the same with the three regimens.

PRECAUTIONS

Elderly patients are susceptible to orthostatic hypotension[31] and postprandial decreases in blood pressure,[32] both of which may go unnoticed unless they are looked for, and both of which may be aggravated by antihypertensive therapy. Because many older patients have significant atherosclerotic occlusive disease in vital vascular beds, sudden reductions in blood pressure should be avoided to guard against hypoperfusion in organs supplied by atherosclerotic arteries. Blood pressure should be measured in the seated (or supine) and standing positions routinely, before and during antihypertensive therapy. Antihypertensive drug treatment should be initiated for elderly patients with half of the usual starting doses. Blood pressure should be reduced gently and slowly to avoid orthostatic hypotension. Increments in doses should be made no more often than every 3 to 4 months, unless hypertension is severe.

The National High Blood Pressure Education Program Working Group report points out some of the psychosocial problems in managing hypertension in the elderly.[1] These include the tendency for elderly patients to take multiple medications, in-

cluding over-the-counter drugs, thus enhancing the possibility of drug interactions. Adherence to regimens may be impeded by transportation problems, impediments in hearing, eyesight, and cognition, the absence of a caregiver or a social support system, and a lack of adequate financial resources with which to buy drugs and pay for needed medical care. Yet there are few things physicians can do that will benefit elderly patients more than treating their hypertension.

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