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A 91-Year-Old Woman With Difficult-to-Control Hypertension A Clinical Review

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Abstract

IMPORTANCE—Hypertension is common among people older than 65 years, affecting nearly two-thirds of men and three-fourths of women by age 75 years. Treatment goals and medication selection for this population may differ from those for younger patients.

OBJECTIVE—To discuss the presentation, pathophysiology, and optimal treatment of hypertension among elderly persons.

EVIDENCE REVIEW—MEDLINE was searched from 1990 to 2013. A hand search of bibliographies from guidelines and review articles from 2000 to 2013 was also used to identify studies of hypertension treatment in patients older than 65 years.

FINDINGS—Hypertension in elderly people differs from that in younger people in that (1) hypertension is predominantly systolic because of vascular stiffness; (2) it is associated with reduced baroreflex sensitivity, which increases blood pressure variability and vulnerability to hypotension during common daily activities; (3) it is associated with cognitive and functional decline as well as adverse cardiovascular outcomes; and (4) hypertension may be beneficial in frail people older than 85 years. Treatment of healthy patients up to age 85 years with most antihypertensive medications reduces cardiovascular morbidity and mortality and possibly cognitive and functional decline.

CONCLUSION AND RELEVANCE—Although patients in their 90s have not been studied, any ambulatory and independent patient older than 80 years should have multiple blood pressure measurements taken during their usual daily activities, and if these show persistent hypertension, these patients should be treated judiciously.

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Dr Burns Ms H is a 91-year-old African American woman with difficult-to-control hypertension. For more than 20 years, her blood pressure (BP) was reasonably controlled with hydrochlorothiazide, 25 mg/d. Over the past year, her BP has fluctuated and her current regimen now include samlodipine, 5 mg/d; atenolol, 75 mg/d; chlorthalidone, 25 mg/d; and lisinopril, 40 mg/d. Despite the 4-drug regimen, Ms H's systolic BP has ranged from 146 to 196 mm Hg and her diastolic BP from 82 to 92 mm Hg, with 1 systolic value as high as 202 mm Hg. Spironolactone was added to her regimen recently; however, her systolic BP decreased to 107 to 110 mm Hg and she reported dizziness.

In addition, at a routine visit in the past year, the nurse practitioner who has cared for her for more than 20 years noted an auscultatory gap in systolic BP between 150 and 120 mm Hg.

Her echocardiogram 10 months prior showed mild symmetric left ventricular hypertrophy with normal systolic function (left ventricular ejection fraction of 70%). Her creatinine began to increase 9 months prior, rising from a stable baseline of 0.9 mg/dL to 1.4 mg/dL when most recently checked.

Her medical history is notable for removal of a right eye cataract in 2004 and glaucoma for which she uses timolol 0.5% eye drops twice per day and latanoprost 0.005% eye drops once per day at bedtime.

Ms H is a lifetime nonsmoker and drinks alcohol rarely. She is active, walking as part of a senior program in her neighborhood daily. She is interested in better BP control to prevent a stroke.

On examination, her systolic BP in both arms with an adult cuff was 184 mm Hg at the onset of Korotkoff sounds, which ceased at 162 mm Hg; after a period of silence, sounds reappeared at a systolic BP of 140 mm Hg. Diastolic BP was 90 mm Hg. Her weight was 151.3 lb, height was 62.5 in, and body mass index was 27.1 (calculated as weight in kilograms divided by height in meters squared). Her jugular veins were not distended. Her lungs were clear bilaterally without adventitious sounds. Her cardiovascular examination revealed a nondisplaced point of maximal impact, a pulse of 51/min, regular, normal S₁ and S₂, and a grade 1–2/6 systolic ejection murmur at the left sternal border, with no murmurs, rubs, or gallops. Carotid upstrokes were normal bilaterally; there were no carotid, abdominal, or femoral bruits. Her peripheral pulses were strong bilaterally.

Ms H: Her View

I have never been sick, so this high blood pressure makes me very nervous. When I come in here and hear about people with high blood pressure who have a stroke, that really upsets me. I have had to learn to calm down because that doesn't help my blood pressure.

I usually get up in the morning and take my medicine, so I will know that it's done and I am getting in the habit of doing that so I do not forget. About 2 or 3 weeks ago my doctor added on a half of a pill and it started to make me dizzy, so I called him and he told me to cut down on it until I can come in and see him again. So that is what I have done and it has worked out fine.

I want to know how I can get the blood pressure down and keep it down because I do not want something that is going to harm my body. I don't want to have a stroke. I have never had anything like that so just the thought of it gets me nervous, and that is not good for my pressure.

Hypertension

Dr Lipsitz Hypertension is one of the most common and potentially dangerous medical conditions among elderly patients, affecting approximately two-thirds of men and three-fourths of women older than 75 years.¹ Although its role as a risk factor for cardiovascular disease is well established, its important adverse effects on physical and cognitive function in elderly populations are less well recognized. A number of longitudinal studies have demonstrated strong relationships between BP elevation and both physical and functional decline in elderly people. However, there appears to be a J-shaped relationship between the level of BP and adverse outcomes in elderly people, such that both high and low BP are associated with increased risk of cardiovascular events.^{2,3} The thresholds of risk may also differ in subpopulations of older people, suggesting that the optimal window for BP may differ according to patient age and clinical characteristics. These observations make it particularly challenging to define hypertension and determine appropriate treatment targets for elderly people like Ms H. Therefore, Ms H is at a crossroads between taking an aggressive approach to reduce her BP (because in younger people this can prevent strokes and other adverse cardiovascular events) and a more conservative approach (because aggressive BP reduction may cause more harm than good in someone her age).

The discussion herein addresses questions regarding MsH's care, using the best available evidence derived from a search of the medical literature from 1990 to January 2013 using MEDLINE and the key words *hypertension*, *elderly*, *treatment*, and *clinical trials*. A hand search of bibliographies from guidelines and review articles from 2000 to January 2013 was also conducted to identify studies of hypertensive treatment in patients older than 65 years.

The Box summarizes distinguishing features of hypertension in elderly patients.

Defining Hypertension in Elderly Populations

The conventional definition of hypertension is a systolic BP greater than 140 mm Hg and/or a diastolic BP greater than 90 mm Hg.⁴ Because elderly people are more likely to have elevated systolic BP owing to arterial stiffening and exaggeration of the arterial pulse wave reflection, clinicians are more often concerned about systolic hypertension, defined as a systolic BP greater than 160 mm Hg. Despite these definitional thresholds, the risk of cardiovascular disease associated with BP elevation increases continuously with BP levels above 140 mm Hg.⁵ Moreover, the risks of adverse effects from treatment increase with age and the number of medications a person takes. Therefore, rather than a somewhat arbitrary definition, it is more important to define a BP range in which these risks are lowest for different groups of elderly people. Most studies of elderly populations have demonstrated significant reductions in cardiovascular morbidity and mortality, without excessive adverse effects, when systolic BP ranges from 135 to 150 mm Hg and diastolic BP from 70 to 90 mm Hg.⁶ However, no studies have focused on patients like Ms H who are in their 90s.

Measurement of Blood Pressure

Accurate measurement of BP is critical for establishing a diagnosis of hypertension and guiding treatment. It is important to use the proper cuff size (the bladder should encircle 80% of the arm circumference), to keep the brachial artery at heart level, and to follow published guidelines.⁷ There are many pitfalls to BP measurement in elderly patients. These include the auscultatory gap observed in Ms H, which refers to the disappearance of Korotkoff sounds while reducing cuff pressure and reappearance at a lower value, which may be falsely interpreted as the systolic BP if the cuff is not initially inflated high enough to detect the true pressure. This error can be prevented by inflating the cuff above the level at which the radial pulse disappears, usually 200 to 220 mm Hg, or by using an automated oscillometric BP monitor. The higher systolic BP measurement should be used for treatment decisions.

Another pitfall is *pseudohypertension*, or a cuff pressure that exceeds the true intra-arterial pressure because of stiff vessels. This is suspected if the brachial artery is still palpable when the cuff is inflated above the systolic pressure (the Osler maneuver). Other clues to pseudohypertension are treatment resistance and absence of any end organ damage (retinopathy, left ventricular hypertrophy, peripheral vascular disease, or nephropathy) in a patient with persistently high systolic BP recordings. Intra-arterial BP recording may be necessary to confirm a diagnosis of pseudohypertension, obtain a general idea of the difference between cuff and intra-arterial measurements, and establish a range of cuff pressures that can serve as a treatment target.

Clinicians must also be aware of rounding bias and digit preference, which are the tendencies to round BP values up or down and assign certain values to BP, such as zeros (eg, 120, 130, 140) or fives (eg, 125, 135, 145). The BP cuff should be deflated slowly and the exact values at which Korotkoff sounds start or stop should be reported whenever possible.

Because both age and hypertension impair BP regulation, pressures can be quite variable in elderly patients during daily activities.⁸ Age- and hypertension-related reductions in baroreflex sensitivity, diastolic ventricular filling, and renal salt and water conservation make older people quite vulnerable to hypotension during activities that reduce preload, such as standing upright, eating a meal, or taking vasodilator or diuretic medications. Furthermore, patients with cardiovascular disease or sleep apnea may have a reversal of the usual circadian BP rhythm, with elevations in BP at night or on awakening. Increased anxiety and sympathetic nervous system activity during clinic visits may result in “white coat” hypertension, which refers to BP elevation in a medical setting but not during usual living conditions. This variability in BP may explain the wide range of recordings noted in Ms H’s case (systolic, 146–196 mm Hg; diastolic, 82–92 mm Hg). Therefore, it is important to measure BP during different activities, at various times of day, in the home and office. This can be accomplished with ambulatory BP monitoring or by giving patients a diary in which they are asked to record their BP, heart rate, and symptoms during specific times or circumstances over a 3-week period using an automated BP machine they can purchase or borrow (eFigure in the Supplement). Using these data, clinicians can determine whether a patient has orthostatic, postprandial, or medication-related hypotension, which would

suggest that antihypertensive medications should be reduced in dose or discontinued; whether their average BP is elevated and therefore should be treated; and whether there is a circadian trend to BP elevation that would warrant antihypertensive therapy at a specific time of day.

Variable Risks of High BP With Advancing Age and Frailty

A number of longitudinal epidemiological studies, most notably the Framingham Heart Study, have clearly demonstrated that hypertension increases the risk of cardiovascular and stroke mortality, coronary artery disease, stroke, renal disease, and peripheral vascular disease.⁵ The absolute risk of these adverse outcomes is highest in elderly patients and appears to increase linearly with the level of BP in the range of 140 to 180 mm Hg for systolic BP and 80 to 100 mm Hg for diastolic BP.⁹ Moreover, studies have shown significant relationships between hypertension and both physical and cognitive functional decline, especially in the cognitive domain of executive function.^{10,11} These more subtle effects of hypertension may have the most far-reaching consequences for elderly people because they are the most common threats to independence and quality of life in advanced age.

Although the adverse effects of hypertension are well established in large community-based populations of relatively healthy people up to age 80 years, there is accumulating evidence that frail elderly people older than 85 years and those with slow gait speed¹² or activities of daily living disability¹³ actually have better outcomes with higher BP, optimally in the range of 140 to 145 mm Hg.³ Several older observational studies of patients aged 75 years or older have found higher relative risks of death in patients with low diastolic or systolic BP^{5,14} and better survival among those with higher BP.^{15,16} A longitudinal study of a Finnish population older than 85 years followed up for an average of 3.5 years showed that the adjusted risk of death was highest in patients with systolic BP less than 140 mm Hg and lowest for those with systolic BP greater than 160 mm Hg.¹⁷ While findings such as these were initially attributed to occult cardiovascular disease and other diseases that lowered BP in patients at high risk of death, studies that excluded the early years of follow-up, stratified patients by their comorbidities, or adjusted for indicators of poor health still demonstrated this relationship.¹⁵

There is also evidence of a J-shaped relationship between the level of BP achieved during antihypertensive treatment and cardiovascular morbidity and mortality, especially in frail elderly cohorts with coronary artery disease or diabetes. Among 22 576 patients with coronary artery disease enrolled in the International Verapamil SR-Trandolapril Study (INVEST), there was a prominent J-shaped relationship for patients older than 70 years between achieved BP while taking verapamil or atenolol and risk of death, myocardial infarction, or stroke. The lowest risk for those aged 70 to less than 80 years was 135/75 mm Hg and for those aged 80 years or older it was 140/70 mm Hg.² In a subset of 6400 INVEST patients with an average age of 66 years with coronary artery disease and diabetes, there was no difference in cardiovascular event rates between those who achieved systolic BP below 130 mm Hg and those with systolic BP below 140 mm Hg. Moreover, the adjusted all-cause mortality rates increased for systolic BP below 115 mm Hg.¹⁸ Taken together, these data

suggest that there may be no additional benefit to systolic BP below 140 mm Hg in frail elderly people or patients like Ms H who have very advanced age.

Safety of BP Lowering in Elderly Patients

Randomized trials involving thousands of elderly people have clearly demonstrated that patients as old as 85 years can be safely treated with antihypertensive medications without excessive adverse effects. However, the patients in these trials may not be representative of those seen in clinical practice. Most have tolerated a run-in treatment period and are relatively healthy. Two particular concerns of clinicians caring for vulnerable older patients are that antihypertensive medications will cause orthostatic hypotension or reduce cerebral perfusion, resulting in falls or syncope.

Ms H demonstrated that excessive antihypertensive use can cause hypotension and threaten cerebral perfusion when she developed dizziness and hypotension after spironolactone was added to her 4-drug regimen. However, hypertension is associated with orthostatic and postprandial hypotension,¹⁹ and the judicious use of antihypertensive medications may actually improve BP regulation and reduce the risk of hypotension.²⁰ In addition to aging, hypertension further impairs baroreflex function, diastolic ventricular filling, and vascular compliance, resulting in marked BP variability and periods of hypotension when preload is reduced.¹⁹ Furthermore, careful treatment of hypertension with a variety of agents can reduce the prevalence of orthostatic hypotension,²⁰ improve vascular compliance, and increase cerebral blood flow in elderly people.²¹ Thus, in the absence of autonomic failure, moderate pharmacologic reductions in BP may help preserve cerebral perfusion.

Antihypertensive Therapy and Morbidity and Mortality in Elderly Patients

There is now ample level I evidence that antihypertensive therapy can significantly reduce cardiovascular morbidity and mortality in relatively healthy patients up to age 85 years. Table 1 summarizes the 9 largest randomized placebo-controlled trials that enrolled patients older than 60 years. All but 1 of these studies has shown a significant reduction in the risk of stroke and at least 3 have shown risk reductions for coronary heart disease events and congestive heart failure. Given competing mortality from other causes in advanced age, it is often difficult to show significant reductions in mortality from interventions in patients older than 80 years. However, even the Hypertension in the Very Elderly Trial (HYVET) showed that a regimen of indapamide with perindopril, if needed, reduced all-cause mortality by 21% (95% CI, 4%-35%; $P = .02$), from 60 deaths per 1000 patient-years in the placebo group to 47 in the treated group, in a population older than 80 years followed up for a median of 1.8 years.³⁰

The effects of antihypertensive therapy on the cognitive consequences of hypertension are still uncertain. Although HYVET did not show a statistically significant effect of antihypertensive therapy on development of dementia in patients older than 80 years, a meta-analysis that combined HYVET data with other placebo-controlled trials of antihypertensive therapy in elderly patients found that antihypertensive therapy had a favorable effect of borderline statistical significance (hazard ratio, 0.87; 95% CI, 0.76–1.00; $P = .045$).³¹

Although Ms H's age exceeds that of most participants of previous clinical trials, her relatively good health and strong desire to prevent a stroke argue in favor of antihypertensive treatment.

How Low Should BP Be Reduced?

Although national guidelines, including the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure,⁴ recommend that BP be lowered to below 140/90 mm Hg, randomized trials in elderly people older than 65 years have rarely achieved this goal.⁶ Nevertheless, as shown in Table 1, these trials have demonstrated significant benefits from systolic BP lowering to between 140 and 150 mm Hg and diastolic BP to 70 to 90 mm Hg with a variety of agents. Neither the Valsartan in Elderly Isolated Systolic Hypertension (VALISH) study,³² which included 3079 patients between 70 and 84 years old, nor the Japanese Trial to Assess Optimal Systolic BP in Elderly Hypertensive Patients (JATOS),³³ which included 4418 patients between 65 and 85 years old, showed any benefit to strict control (systolic BP <140 mm Hg) compared with more modest control (systolic BP <150 mm Hg).

Because the elderly population is so heterogeneous regardless of chronological age, ranging from robust, independent, and healthy individuals to physically and cognitively impaired people, a one-size-fits-all approach to establishing a BP target is not appropriate. Treatment goals must be individualized depending on the BP levels that achieved favorable outcomes in previous studies of comparable patient groups, as well as patients' comorbidities, lifestyle, and preferences. Unfortunately, most of the clinical trials have been conducted in relatively healthy subpopulations and no trials have enrolled sufficient numbers of patients older than 85 years to make generalizable recommendations. Table 2 shows the BP ranges that have been associated with favorable outcomes in relatively healthy populations of systolic and/or diastolic hypertensive patients younger than 85 years. These are generally between 140 to 150 mm Hg for systolic BP and 80 to 90 mm Hg for diastolic BP. Because no data are available for frail patients older than 85 years, recommendations can be based only on observational studies that have demonstrated the greatest risk for systolic BP below 140 or above 160 mm Hg, and the experience of clinicians and patients who see the frequent complications and costs of more aggressive treatment. Therefore, for this group, which includes Ms H, the recommended BP target range is 140 to 150 mm Hg for systolic BP and 80 to 90 mm Hg for diastolic BP.

Management of Hypertension in Elderly Patients

When considering approaches to hypertension management in elderly persons, first, it is important to consider secondary causes of hypertension. The most common of these among older patients are use of nonsteroidal anti-inflammatory, steroid, or adrenergic medications; sleep apnea; hyperthyroidism; and hyperaldosteronism. Renal artery stenosis should be considered in patients whose hypertension is refractory to treatment with more than 3 medications.

Next, once a diagnosis of hypertension is established, nonpharmacologic therapy should be initiated. This includes smoking cessation, sodium and alcohol restriction, weight loss, and

physical activity. These recommendations do not differ from those for younger patients. The TONE³⁴ study of 875 patients aged 60 to 80 years demonstrated that sodium restriction to 1.8 g/d and/or weight loss of 10 lb or more significantly reduced cardiovascular events or the need for pharmacologic therapy by 25% for nonobese patients with salt restriction alone and 53% for obese patients with salt restriction and weight loss. In obese hypertensive patients, the combination of weight loss and sodium restriction resulted in a mean 5.3 (SD, 1.2)–mm Hg decrease in systolic BP and a mean 3.4 (SD, 0.8)–mm Hg decrease in diastolic BP.

When nonpharmacologic approaches are not entirely effective, pharmacologic therapy is indicated. As shown in Table 1, almost all classes of antihypertensive medications have been effective in reducing cardiovascular morbidity and mortality in elderly patients up to age 85 years when BP is lowered to the ranges discussed above. Therefore, the choice of medication is usually based on comorbidities and cost. In the case of Ms H, her racial background and strong desire to prevent a stroke should also be considered.

Diuretics—Thiazide diuretics are the most widely studied and least expensive of antihypertensive agents. Their adverse effects include hypokalemia, hyponatremia, hypomagnesemia, hyperuricemia, hyperglycemia, and urinary frequency or incontinence. They are the preferred first-line treatment for African Americans like Ms H. Chlorthalidone may be slightly more potent and more effective than hydrochlorothiazide in preventing cardiovascular morbidity and mortality,^{35,36} but it is more likely to produce hypokalemia. As single agents in men, thiazide diuretics may be slightly less effective in reducing cardiovascular events or death than angiotensin-converting enzyme inhibitors (ACEIs).³⁷ When combined with an ACEI in high-risk patients, diuretics may be less effective than amlodipine in reducing combined cardiovascular events.³⁸ In patients with congestive heart failure, spironolactone should be considered. This or other potassium-sparing agents can be given in combination with a thiazide diuretic if hypokalemia develops.

β-Blockers—β-Blockers are less effective than other agents in reducing BP and cardiovascular morbidity and mortality in elderly hypertensive patients and African Americans. However, they are useful in patients with coronary artery disease (ie, secondary prevention). If a β-blocker is used to treat hypertension, carvedilol, bisoprolol, and nebivolol are preferred agents. Nebivolol, a selective β₁ antagonist that increases nitric oxide, may produce less depression, sexual dysfunction, hyperlipidemia, and hyperglycemia than other β-blockers.⁶

ACEIs and Angiotensin Receptor Blockers—These are the agents of choice in patients with congestive heart failure, diabetes, stroke, or myocardial infarction. Among patients with an average age of 67 years with hypertension and left ventricular hypertrophy, the Losartan Intervention for Endpoint Reduction in Hypertension (LIFE) study³⁹ showed that losartan was associated with fewer strokes and composite cardiovascular outcomes compared with atenolol.

Calcium Channel Blockers—Long-acting calcium channel blockers have also been proven effective in reducing cardiovascular morbidity and mortality in elderly people,

particularly in those with isolated systolic hypertension and diabetes.²⁸ When combined with the ACEI benazepril, amlodipine has been associated with better outcomes than hydrochlorothiazide in patients at high risk of cardiovascular disease.³⁸ African Americans, like Ms H, also respond better to monotherapy with calcium channel blockers (or diuretics) than to ACEIs, angiotensin receptor blockers, or β -blockers. Short-acting first-generation calcium channel blockers should be avoided in patients with left ventricular dysfunction because of an increased risk of cardiovascular events, possibly related to abrupt drops in BP that can precipitate cardiac ischemia.

Central Sympatholytics—The central nervous system sympatholytics, including α -methyldopa and clonidine, are effective in reducing BP but are poorly tolerated by elderly people because of dry mouth, sedation, depression, confusion, and bradycardia. One advantage to clonidine is that a patch formulation is available for patients who are poorly adherent to oral medications.

α -Blockers—The α -adrenergic receptor blockers, including prazosin, doxazosin, and terazosin, are useful in elderly men with urinary outlet obstruction due to prostatic hypertrophy, but they commonly cause orthostatic hypotension and syncope and were associated with an increased risk of stroke and heart failure in the ALLHAT study.⁴⁰ Therefore, their use is discouraged for the treatment of hypertension.⁶

Patients with persistent hypertension at home as well as in the clinician's office despite use of at least 3 of the above classes of medications at optimal doses are considered to have refractory hypertension. These patients should first be assessed for adherence to their medications. Their pharmacist may be able to determine if prescriptions have been filled at the proper times. If a patient is taking his or her medications but is not already taking a diuretic, one should be added to the regimen. This often has a large effect on BP control, especially in African American patients. If the patient still has refractory hypertension but no adverse end organ effects, he or she could have pseudohypertension. In the case of pseudohypertension, a recording of the finger pressure (eg, Portapres or Finometer [Finapres Medical Systems], available in cardiovascular research laboratories and anesthesia departments) may provide a better representation of the intra-arterial pressure. Finally, if the BP is truly refractory to treatment, the patient should be evaluated for renal artery stenosis.

Recommendations for Ms H

Despite her advanced age of 91 years, Ms H is highly functional and wants to avoid the potential complications of hypertension. Although data on antihypertensive therapy for patients older than 90 years are not available, it is reasonable to aim for a BP level of 160/90 mm Hg or lower to help preserve her high cognitive and functional levels. I suggest measuring her BP during daily activities (after posture change, meals, and medications) to determine her BP profile. If her BP is elevated in the early morning but declines after standing up or eating a meal, her antihypertensive medications should be taken before she goes to bed at night.

In the absence of coronary artery disease, atenolol can be tapered and discontinued. Given the presence of left ventricular hypertrophy, an ideal regimen for her would be amlodipine (5–10 mg) plus an angiotensin receptor blocker or ACEI and, if needed to achieve a BP of less than 160/90 mm Hg, a thiazide diuretic. The rationale for not using a thiazide as a first-line agent is that it has a potential for incontinence and hypokalemia. Of course, Ms H should continue to keep active, maintain a low-salt diet, and continue to exercise regularly.

Questions and Discussion

QUESTION How do you separate elderly patients who need treatment from those who do not?

DR LIPSITZ This is the crossroads our patient faces. I suggest using a patient's functional status rather than age as a determining factor. An individual who is still going into the office at age 85 years, is functioning as chairman of the board, or enjoys going to the golf course is a good candidate for treatment to maintain his or her high functional level. I would treat such a patient with up to 4 medications to keep his or her BP level at or below 160/90 mm Hg. I would ease the medications if they develop adverse effects. On the other hand, I may not treat a very frail individual who is already taking multiple medications and is at high risk of adverse medication effects. I would be content to leave such a patient's systolic BP as high as 180 mm Hg. If one were to do home monitoring of such a patient's BP, one would probably find that many times during the day the BP is actually relatively low, particularly after meals or when standing up.

QUESTION What is the role of home BP readings when managing hypertension in the elderly?

DR LIPSITZ Home BP recordings are very useful to assess whether patients have persistent hypertension or highly variable BP with normal values at certain times of day. Sometimes patients have a systolic BP of 160 mm Hg first thing in the morning but as soon as they eat a meal, the systolic BP declines to 120 mm Hg. I would not treat such an individual. In this case the clinician should question why the patient is so hypertensive in the morning. Maybe he or she has sleep apnea or a reversal of the normal circadian rhythm. If hypertension is observed overnight, clinicians might choose to give a patient a short-acting antihypertensive medication before he or she goes to bed.

QUESTION How much should one focus on giving antihypertensive medications at bedtime given recent data on the potential advantage of restoring nocturnal dipping that can be seen on ambulatory monitoring?

DR LIPSITZ The value of using nocturnal dipping as the focus for treatment is not well established, particularly in older patients. Instead, I would focus my attention on treating the daytime BP.

QUESTION How do you negotiate with patients about lifestyle changes, such as low-salt diets, that significantly hurt their quality of life?

DR LIPSITZ This is a negotiation that requires recognition that quality of life trumps almost everything else. One might explain that quality of life depends on preventing a future stroke or heart attack. Dietitians are very helpful in suggesting spices other than salt that people can use. Sometimes there are cultural influences on what foods people eat, so it is important to take these into consideration. Diuretics might be needed to counter the effects of a high-salt diet.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Box. Features That Distinguish Hypertension in Elderly vs Younger Patients

Predominantly systolic elevations due to vascular stiffness

Reduced baroreflex sensitivity, which manifests as a reduced heart rate and vasoconstrictor response to sympathetic activation

Vulnerability to hypotension during common daily activities such as posture change or meal digestion, in response to medications, and during volume contraction

Marked variability in blood pressure

Association with cognitive and functional decline

Possible beneficial effect in frail “survivors” older than 85 years

Outcomes of Randomized Placebo-Controlled Clinical Trials Providing Level I Evidence of Antihypertensive Therapy in Elderly People

Table 1

Source	No. of Participants	Age Range, y	Blood Pressure at Entry, Mean, mm Hg	Intervention Drug	Risk Reduction, %		
					Stroke	CHD	CHF
EWPHF, ²² 1988	840	>60	182/101	Hydrochlorothiazide ± α-methyldopa	36	20	22
Coope and Warrender, ²³ 1987	884	60–79	197/100	Atenolol ± bendr of luazide	42 ^a	0.03	32
STOP, ²⁴ 1991	1627	70–84	195/102	Atenolol ± hydrochlor othiazide/amiloride	47 ^a	13	51 ^a
MRC, ²⁵ 1992	4396	65–74	185/91	Hydrochlorothiazide ± amiloride vs atenolol	25 ^a	19	
SHEP, ²⁶ 1991	4736	60–80	170/77	Chlorthalidone ± atenolol/reserpine	33 ^a	27 ^a	55 ^a
HDFFP, ²⁷ 1979	2376	60–69	170/101	Stepped care: chlorthalidone, reserpine, hydralazine, guanethidine	45 ^a	15 ^a	
Syst-Eur, ²⁸ 1997	4695	>60	174/86	Nitrendipine ± enalapril/hydrochl or othiazide	42 ^a	30	29
Syst-China, ²⁹ 2000	2394	>60	171/86	Nitrendipine ± captopril/hydr ochlor othiazide			
HYVET, ³⁰ 2008	3845	80–105 (Mean, 84)	173/91	Indapamide ± perindopril	39 ^{a,b}	34 ^{a,c}	64 ^a

Abbreviations: CHD, coronary heart disease; CHF, congestive heart failure; EWPHF, European Working Party on Hypertension in the Elderly trial; HDFFP, Hypertension Detection and Follow-up Program; HYVET, Hypertension in the Very Elderly Trial; MRC, Medical Research Council trial; SHEP, Systolic Hypertension in the Elderly Program; STOP, Swedish Trial in Old Patients With Hypertension; Syst-China, Systolic Hypertension in China trial; Syst-Eur, Systolic Hypertension European trial.

^a $P < .05$.

^b Fatal stroke.

^c Any cardiovascular event.

Table 2
Targets for Blood Pressure Lowering in Different Groups of Elderly Patients

Age Range, Y	Health Status	Hypertension Type	Achieved Blood Pressure, mm Hg	Positive Outcomes	Target Blood Pressure, mm Hg	Evidence Source	Evidence Class
65–80	Healthy	Systolic	143/68–151/79	Stroke, CAD, CHF	<150/80	SHEP, ²⁶ Syst-Eur, ²⁸ Syst-China ²⁹	1A
65–85	Healthy	Mixed	150/80–178/87	Stroke ± CAD, CHF	<150/90	Coope and Warrender, ²³ STOP, ²⁴ MRC, ²⁵ HDFP ²⁷	1A
>80	Healthy	Mixed	144/78	Death, CHF, cardiovascular events	<145/90	HYVET ³⁰	1B
>85	Disabled	Any	No studies	No studies	<160/90	Expert consensus	1IC

Abbreviations: CAD, coronary artery disease; CHF, congestive heart failure; HDFP, Hypertension Detection and Follow-up Program; HYVET, Hypertension in the Very Elderly Trial; MRC, Medical Research Council trial; SHEP, Systolic Hypertension in the Elderly Program; STOP, Swedish Trial in Old Patients With Hypertension; Syst-China, Systolic Hypertension in China trial; Syst-Eur, Systolic Hypertension European trial.