Systolic Hypertension in Older Patients
Case Study and Commentary, Jason D. Schaechter, BS, and Raymond R. Townsend, MD

Abstract
Hypertension affects more than one half of patients older than 65 years and remains one of the major modifiable risk factors for cardiovascular disease in this population. Systolic blood pressure is now recommended as the principal clinical end point for detection, evaluation, and treatment of hypertension. The systolic blood pressure treatment goal is less than 140 mm Hg in patients without risk factors such as diabetes. Lifestyle and dietary modification are recommended for all hypertensive patients, and this includes weight loss, salt restriction, and smoking cessation. Thiazide diuretics are the preferred first-line agents for medical therapy, with β blockers and long-acting calcium channel blockers as other potential first options. Most patients with systolic hypertension will require 2 to 3 drugs to achieve goal blood pressure. Care should be taken to maintain the diastolic blood pressure at 55 mm Hg or higher, as pressures below this value are associated with an increase in cardiovascular risk.

Nearly 50 million Americans have hypertension, an important risk factor for many vascular diseases, including stroke, ischemic heart disease, heart failure, and chronic kidney disease [1]. Hypertension is common in the elderly in the United States, with prevalence estimates of 60% in patients aged 65 to 75 years and 70% in patients older than 75 years [2–5]. Data from the Third National Health and Nutrition Examination Survey (NHANES III) shows that only 55% of Americans who are aware of having hypertension are being treated with medication [2]. Furthermore, blood pressure reduction below 140/90 mm Hg is achieved in only 29% of all patients with hypertension. The failure to adequately treat hypertension to goal values once drug therapy is initiated results in the suboptimal blood pressure control noted in the majority of cases [4] and likely contributes to morbidity and mortality from stroke, coronary heart disease, heart failure, and end-stage renal disease [3].

The NHANES III data also support the finding that continued systolic blood pressure elevation is the parameter that most often contributes to poor blood pressure control [2]. In this article, 2 illustrative cases are presented that underscore the nuances of treating systolic hypertension. The cases are representative of the gamut of issues encountered in the outpatient management of hypertension. The therapeutic approach taken in each case represents an amalgam of formal evidence-based treatment recommendations tempered with changes made as needed based on the physiology of systolic hypertension and patient quality of life.

CASE STUDY 1
Initial Presentation
A 70-year-old white woman concerned about her uncontrolled hypertension presents to her primary care physician.

History
She has a history of uncomplicated hypertension for 35 years, with the gradual onset of poorer control in the past few years. Current medications are atenolol 50 mg twice daily, doxazosin 4 mg daily, and hydrochlorothiazide (HCTZ) 25 mg daily. She does not have diabetes and has no known heart disease. Her family history shows maternal hypertension, which was controllable, but the patient cannot recall specific medications. Her father died from a stroke in his 70s, and her brother died from heart disease at age 68 years. She does not have any lipid disorders and is not aware of any in her family. She smoked 1 pack of cigarettes per day for approximately 50 years, although she has now reduced her smoking to 6 or 7 cigarettes per day. She consumes an occasional alcoholic beverage and exercises by walking. She denies the use of nasal sprays, decongestants, and amphetamines. She is married and works part-time in a clothing shop.

On review of systems, the patient states that she feels “OK” and has good appetite. She is not short of breath and has no chest pain or palpitations. She does not sweat spontaneously. Her bowels are normal. She reports an occasional episode of nocturia. She denies headaches or dizziness as well as symptoms of sleep apnea. She describes herself as somewhat “hyper” and has been told by other physicians that she may suffer from “white coat” hypertension.

Physical Examination
The patient is 67” tall and weighs 139 lb. Her body mass index (BMI) is normal at 21.9 kg/m². Averaged blood pressures...
(2 readings rounded to the nearest even digit in mm Hg) and heart rate (bpm) are as follows:

<table>
<thead>
<tr>
<th>Position</th>
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<th>Left Arm</th>
<th>Cuff Size</th>
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<tr>
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</tr>
<tr>
<td>Standing</td>
<td>184/98</td>
<td></td>
<td></td>
<td>70</td>
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</table>

Head, eyes, ears, nose, and throat examination shows a supple neck, no carotid bruits, and no distended veins. Thyroid evaluation is normal. Funduscopic examination shows vessels with arteriolar narrowing. The chest is clear. The heart is normal with no galls noted. Upon abdominal examination, soft systolic bruits are noted in the midline and in both upper quadrants. A faint systolic bruit is also noted in each lower quadrant. All pulses are palpable except for the dorsalis pedis, which cannot be palpated bilaterally.

On electrocardiogram (ECG), there is no evidence to suggest left ventricular hypertrophy (LVH). Recent testing showed a creatinine value of 0.7 mg/dL and a potassium value of 4.1 mEq/L.

• What factors could be contributing to this patient’s elevated systolic values?

**Isolated Systolic Hypertension**

As defined by JNC-VI, when systolic blood pressure is 140 mm Hg or greater with associated diastolic pressure less than 90 mm Hg, systolic blood pressure elevation is classified as isolated systolic hypertension, irrespective of age [3]. Systolic hypertension is believed to be an age-related process involving vascular changes that ultimately result in decreased arterial compliance. The fall in vascular compliance is the dominant factor in the rise of systolic blood pressure from age 50 years on [6]. Reduced arterial compliance results from an imbalance in the quantity of nonelastic collagen (which increases with aging) and a reduction in the intact elastin in vascular walls accompanied by a proliferation and subsequent migration of undifferentiated muscle cells of the tunica media to the intima. These changes cause an increase in arterial stiffness, resulting in vessels without elasticity. As this arterial stiffening proceeds, the velocity in the reflection of the pressure waves generated with each heartbeat from the periphery back to the heart is enhanced, which contributes further to a disproportionate increase in systolic blood pressure (Figure) [7].

Up to 60% of elderly hypertension patients are believed to have isolated systolic hypertension [8]. In the Framingham Study, 57.4% of men and 65.1% of women older than 65 years were diagnosed with isolated systolic hypertension [9]. The principal outcome associated with isolated systolic hypertension is cardiovascular disease, including stroke. Although systolic blood pressure traditionally had been considered the less important metric, its predictive potential for cardiovascular disease has gained much recent attention. A meta-analysis conducted by Staessen and colleagues on data from 15,693 patients showed that systolic blood pressure elevations of 10 mm Hg yielded hazard rates of 1.26 for total mortality, 1.22 for stroke, and 1.07 for coronary events [10]. Moreover, the Multiple Risk Factor Intervention Trial, which evaluated 316,099 men, found that systolic blood pressure was a stronger predictor of cardiovascular outcomes than diastolic pressure.
predic tor for assessing risk for cardiovascular disease than was

White Coat Hypertension

JNC-VI defines white coat hypertension as blood pressure
raised in the clinical setting but normal at other times [3].
Self-measurement outside of the physician’s office or ambu-
latory blood pressure monitoring may be useful in deter-
mapping if the clinical setting is indeed responsible for the
blood pressure elevation. White coat hypertension is seen
more often in elderly women [12]. Disagreement exists re-
garding exact mm Hg values that constitute “normal” at
home and “high” in the health care setting. We generally use
values of less than 130 mm Hg for systolic (< 85 mm Hg dia-
stolic) at home and greater than 140 mm Hg for systolic
(> 90 mm Hg diastolic) in the office. In making a diagnosis of
white coat hypertension, it is important to ensure that the
patient is using an accurate device and performing the mea-
urement correctly [13].

In some cases of white coat hypertension, particularly
systolic values greater than 160 mm Hg in the office, an
echocardiogram may be useful to rule out the possibility of
diastolic dysfunction or LVH since drug treatment for hyper-
tension is sometimes withheld in these patients. If the echoc-
diagram shows impaired left ventricular diastolic func-
tion or LVH, initiation of antihypertensive drug therapy
would be reasonable. If the health care setting is causing a
blood pressure elevation because of a heightened sympa-
thetic nervous system response, it is conceivable that other
perceived stressful environments could elevate blood pres-
sure as well. If such circumstances exist, it may be prudent to
treat the augmented blood pressure, although debate per-
sists on this issue [14]. Moreover, it is also possible that some
patients, particularly older patients with predominantly sys-
tolic hypertension, have greater lability in blood pressure
readings that is most pronounced in the systolic blood pres-
sure readings and is evident at home as well as in the office
setting [15]. White coat hypertension does affect patients
with hypertension and should be considered in patients
with “drug-resistant” hypertension [16].

Pseudohypertension

Due to age-related increases in arterial wall rigidity from
medial sclerosis and calcification, falsely augmented sphy-
momanometer readings (pseudohypertension) occasionally
occur in the elderly population. A higher cuff pressure is
required to occlude these rigid arteries, and an augmented
systolic pressure reflects the pressure necessary to collapse the
sclerotic calcified wall, not the true intra-arterial pressure.
Although verification of pseudohypertension requires an
intra-arterial pressure measurement, the clinician may suspect
it when the brachial or radial artery is clearly palpable after
inflation of the blood pressure cuff to values that render the
artery pulseless. In some cases, the patient may report symp-
toms of severe dizziness and even syncope with “good” blood
pressure control on medication; therefore, great care should be
taken when measuring blood pressure [17].

- What is the significance of the abdominal bruits?

Abdominal bruits auscultated in the epigastric region in con-
junction with hypertension may be a sign of renal vascular
hypertension. Studies suggest that between 75% and 85% of
patients with renal artery stenosis demonstrated by angiog-
raphy have abdominal bruits [18]. It is beyond the scope of
this review to fully discuss renovascular disease and reno-
vacular hypertension, but recent studies suggest that it is
worthwhile to attempt medical therapy in many patients
with hypertension and renal artery stenosis [19].

- Are laboratory tests recommended in this patient?

The findings from the history and physical examination
indicate a significant elevation in systolic blood pressure,
which requires consideration of further diagnostic and phar-
macologic intervention. Routine laboratory tests are recom-
pended to further assess any target organ damage or other
confounding factors prior to drug intervention when the
presenting hypertension is below a systolic pressure of
180 mm Hg and below a diastolic pressure of 110 mm Hg, or
coincident with medication changes when the hypertension
is more severe [3]. Tests include urinalysis, complete blood
cell count, and blood chemistry, including measurement of
potassium, creatinine, glucose, and lipid levels. Secondary
hypertension etiologies such as pheochromocytoma, prima-
ry aldosterone excess, and renovascular diseases are all wor-
thy of consideration in patients who present with refractory
hypertension. Some authorities suggest measuring plasma
renin activity and serum aldosterone concentration to screen
for aldosterone excess [20]. There is nothing to suggest cate-
cholamine excess in this patient.

Management

Routine laboratory tests are ordered. Because of the
patient’s “white coat” history, the physician recom-
mands that she obtain a home blood pressure kit, and she is
asked to bring data from her home monitoring to the next
visit. Plasma renin activity and serum aldosterone concentra-
tion tests are discussed with the patient, and an appointment
is made to perform these tests before her next visit. Pursuit of
renovascular disease is discussed, but the patient is reluctant to undergo further evaluation unless “absolutely necessary.” It is agreed to try medication adjustment first, assuming reasonable renal function can be maintained.

• What is the recommended treatment for systolic hypertension?

Lifestyle Changes
For all forms of hypertension, lifestyle and dietary modifications are helpful in blood pressure reduction. Lifestyle modifications prevent or delay normotensive patients from developing hypertension later in life [21,22]. Patients should be encouraged to increase their amount of physical activity, for example, by trying to walk 1 mile a day. Sodium intake should be reduced to less than 2.4 g per day [3], and a “sodium counter” type of handout should be provided. Use of tobacco should be discouraged. Those who continue to smoke during the course of antihypertensive therapy may fail to benefit from medication as much as nonsmokers [23].

Lifestyle modifications become even more vital for the treatment regimen when patients have additional cardiovascular disease risk factors such as dyslipidemia or diabetes mellitus. In the DASH diet study, a diet rich in fruits and vegetables and low in fats, especially saturated fats, significantly lowered blood pressure [24]. For patients who are currently overweight with a BMI of 27.5 kg/m² or more, a weight reduction of as little as 10 lb may result in reduced blood pressure [25]. Evidence suggests that although lifestyle modifications alone are often not sufficient to control elevated blood pressure, they reduce the number of antihypertensive medications required to ultimately achieve blood pressure control [26].

Drug Therapy
In untreated hypertensives with blood pressures less than 160 mm Hg systolic, if the blood pressure goal is not achieved by lifestyle modification alone after approximately 3 to 6 months, then drug therapy is indicated. Thiazide diuretics or β blockers are considered first option medications, with diuretics being the preferred first-line intervention [3]. The Systolic Hypertension in the Elderly Program (SHEP) treated patients with isolated systolic hypertension with chlorthalidone 12.5 mg to 25 mg, and atenolol 25 to 50 mg was added in patients with more stubborn hypertension; the results showed significant reductions in stroke, myocardial infarction, and left ventricular failure [27]. In the Systolic Hypertension in Europe trial, the dihydropyridine calcium antagonist nitrendipine decreased the incidence of stroke by 42% [28], earning dihydropyridine calcium channel blockers consideration as therapy for systolic hypertension [3]. It is important to remember that if dihydropyridine calcium channel blockers are used, the short-acting (immediate) forms should be avoided because they increase cardiovascular risk [29].

The recent STOP hypertension trials suggest that even patients at the extremes of older age derive benefit from systolic and diastolic blood pressure control [30]. Drawbacks to pharmacologic intervention exist, however. Elderly patients commonly suffer from glucose intolerance, a condition that may be worsened by diuretics and β blockers. Therefore, medication choice should include consideration of existing risk factors.

An important point regarding hypertension treatment is the need to discard the myth of monotherapy. Using a single agent to control systolic blood pressure is effective in less than half of patients, and achieving the currently recommended systolic blood pressure goals will usually require 2 or 3 drugs. Of these, at least 1 is usually a diuretic, and another will often be a dihydropyridine calcium channel blocker.

Adjustment of Antihypertensive Regimen
At the initial visit, the patient is prescribed amiloride 5 mg daily (titrating to 10 mg daily in 2 weeks), and she remains on her other medications. In addition, the physician discusses with the patient the issue of salt restriction and encourages her to participate in physical activity. He strongly recommends that she stop smoking and discusses available options such as nicotine replacement and behavioral therapies. A follow-up visit is scheduled in 6 weeks to assess the effectiveness of the medication change and for the presence of any adverse side effects.

• Why was a potassium-sparing diuretic selected?

The amiloride choice was based on the finding that many older patients have low plasma renin activity, and manipulation of the diuretic regimen is often effective in such circumstances [31,32]. If the patient is already on a thiazide diuretic, as the case patient is, consideration of spironolactone or amiloride is reasonable [33]. By binding to and blocking luminal sodium channels, amiloride inhibits sodium reabsorption from the late distal tubule and collecting duct. Minimizing sodium retention is often the key to improvement in low-renin hypertension patients. Because of the potassium-sparing nature of amiloride (and spironolactone), it is important to periodically monitor serum potassium and to be cautious in the use of angiotension-converting enzyme (ACE) inhibitors, angiotensin receptor blockers, and nonsteroidal anti-inflammatory drugs, all of which may potentiate the
retention of potassium. Diabetics and patients with impaired renal function are at greater risk of hyperkalemia.

Alternatively, a long-acting dihydropyridine calcium channel blocker such as amlodipine, felodipine, isradipine, or nisoldipine could have been used in this patient, as reviewed above. In addition, an ACE inhibitor [34] or an angiotensin receptor blocker [35] is also effective in systolic hypertension when used with a diuretic. Recently, the LIFE study compared an angiotensin receptor blocker with a β-blocker-based regimen for treatment of isolated systolic hypertension. Although similar blood pressure reduction and virtually identical blood pressure control were achieved with each therapy, cardiovascular events were significantly reduced in the angiotensin-receptor blocker group compared with the β-blocker group, suggesting that in some cases specific mechanisms of antihypertensive therapy may provide greater cardiovascular benefit [35]. In the case patient, we were reluctant to use an ACE inhibitor or an angiotensin receptor blocker because of the bilateral bruits [36].

**Follow-up at 6 Weeks**

The patient returns for her follow-up visit. Blood testing results show a plasma renin activity of 0.4 ng A-1/mL/h. This value is somewhat on the low side for an average salt intake, but measurement of urine sodium was not done with which this could be verified. β-Blocker therapy suppresses plasma renin and may be a contributing factor in this case. The serum aldosterone concentration is 19 ng/dL, which is within the laboratory limits of normal when the sample for the tests is drawn with the patient in the seated position (the sample was drawn in the seated position, at midday, without any specific preparation such as high salt intake). The physician interprets these results as indicative of low renin activity, even if the β blocker is a factor, with evidence of some aldosterone effect. These findings support the use of a potassium-sparing diuretic approach.

Blood pressures taken in the left arm (which had a higher diastolic value compared with the right arm) with the patient sitting were as follows: 164/72 mm Hg, 172/74 mm Hg, and 154/70 mm Hg. Heart rate is 56 bpm. The patient has responded to the amiloride. Her potassium level is measured again at 4.3 mEq/L. As such, the amiloride is titrated to the maximal dosage, 20 mg daily taken as 10 mg twice daily.

Her home blood pressures have ranged around 150 mm Hg systolic and have been as low as 134/69 mm Hg. She has brought her Omron HEM 711 device with her, and the physician checks it against the office readings by having the patient measure her own (supervised) blood pressure during the visit. The instrument is judged to be accurate (within 4 mm Hg systolic) and the patient’s technique appears to be good. A follow-up visit is scheduled.

**At 10 Weeks**

The patient’s record of at-home blood pressures shows that her readings have usually been below 140 mm Hg systolic. Office blood pressures (not averaged this time) in the left arm with the patient seated are 156/70 mm Hg, 146/72 mm Hg, and 138/74 mm Hg. The heart rate is 54 bpm. The patient has maintained her response to the amiloride. Her heart rates are low, and in the future it may be possible to reduce her β-blocker dosage; however, this remains a long-term goal. The patient is asked to return for a follow-up visit in 3 months.

- How does diastolic blood pressure respond to treatment for systolic hypertension?

During the course of treatment for systolic hypertension, antihypertensive medications may inadvertently lower an already controlled diastolic blood pressure. Data from the SHEP study showed that diastolic pressures that fell below 55 mm Hg in elderly patients were associated with a modest rebound increase in the risk for stroke [37]. In younger patients, the usual blood pressure reduction is in the range of 3 mm Hg systolic for each 2 mm Hg diastolic, and reduction of 12/8 mm Hg is common. In older patients with systolic hypertension, it is common to see reductions of 3 or even 4 mm Hg systolic for each 1 mm Hg diastolic pressure reduction.

One caveat in treating hypertension has to do with “over-treatment” in which the degree of blood pressure lowering results in a loss of antihypertensive benefit and an actual increase in cardiovascular risk. This tends to occur principally when the diastolic blood pressure is excessively lowered and is known as the J-point phenomenon. This issue was partially addressed in the HOT study but not laid to rest [38]. In HOT it appeared that the subjects achieving the lowest diastolic blood pressure values had confidence intervals for cardiovascular risk that suggested an increase in risk at the extremes of achieved diastolic values. At present, it is generally recommended to maintain the diastolic blood pressure at or above 55 mm Hg to minimize risk from the J-point phenomenon [37].

**Follow-up at 28 Weeks**

At this visit, the blood pressures (not averaged) in the left arm with the patient seated are 148/72 mm Hg and 148/72 mm Hg. Heart rate is 58 bpm. Her creatinine level is 0.9 mg/dL and glucose (fasting) is 80 mg/dL. When the physician questions the patient about side effects from her therapy, she states that she has been feeling tired since starting the atenolol and is a little more tired now; however, it is
not restricting daily activities, and she agrees to bear with it for a while longer. At this time there are no plans to pursue the renovascular disease further, but it remains an option for the future.

- **How can the patient’s complaint of fatigue be addressed?**

Blood pressure control in this patient is now reasonable, and her creatinine has not changed in the course of therapy. In some patients, step-down therapy can be undertaken to address side effects, but we usually reserve this maneuver until after approximately 8 to 12 months of prolonged blood pressure control has been in place. If fatigue on therapy is not so profound as to interfere with daytime activity, we encourage patients with refractory hypertension who have responded well to therapy to stay with the regimen. We specify an interval such as “another 3 months” since an exact period is usually more likely to be accepted by the patient. In some patients, the fatigue lessens as the adaptation to either the drug, the lower blood pressure, or both improves. In others, a change in therapy becomes necessary when fatigue persists or worsens.

**CASE STUDY 2**

**Initial Presentation and History**

A 60-year-old woman concerned about her uncontrolled hypertension presents to her primary care physician. Antihypertensive therapy was started about 9 years ago, but blood pressure control has become increasingly difficult recently. Current medications include verapamil-long acting 240 mg daily and metoprolol-XL 50 mg daily. The patient is not diabetic and has no known heart disease and no known drug allergies. Her past medical history is remarkable for a stress/anxiety disorder diagnosed at age 34 years. Her family history shows an absence of any known hypertension in her parents. No information regarding dyslipidemia or renal disease is known. Social history shows that she smoked briefly when younger. She also drank alcohol, sometimes “excessively” when younger, but not in the past 10 years. She had exercised daily in the past, but recently her physical activity has been curtailed due to back discomfort. She states that she is under significant family-related stress.

On review of systems, the patient shows a stable weight. She is not short of breath and has no chest pain. She has noted a fluttering sensation in the chest in the past. She does not sweat spontaneously. Her bowels are constipated. She denies headaches or dizziness. She denies symptoms of sleep apnea.

**Physical Examination**

On physical examination, the patient is 60’’ tall and weighs 112 lb. Her BMI is normal at 21.9 kg/m². The blood pressures (average of 2 readings, rounded to an even digit) are as follows:

<table>
<thead>
<tr>
<th>Position</th>
<th>Right Arm</th>
<th>Left Arm</th>
<th>Cuff Size</th>
<th>Heart Rate</th>
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<td></td>
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<td>192/88</td>
<td>186/84</td>
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<tr>
<td>Standing</td>
<td>192/92</td>
<td></td>
<td>76</td>
<td></td>
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</tbody>
</table>

Head, eyes, ears, nose, and throat examination show a supple neck, no carotid bruits, unremarkable fundi, and no jugular venous distension when upright. The chest is clear to auscultation with symmetric sounds. The heart examination is normal. Extremities are without edema, and the pedal pulses are intact. There are no abdominal bruits.

The patient has brought with her records of a recent ECG and results from laboratory testing done within the last 6 months. These are unremarkable.

**Management**

The physician discusses performing renin activity and serum aldosterone tests with her, but she declines these unless they are “absolutely necessary.” The physician also discusses the nature of primary/essential hypertension versus secondary forms with the patient, explaining that systolic hypertension is a disorder of vascular stiffness and indicating that his approach to therapy for predominantly systolic hypertension is to incorporate a diuretic into the regimen. She has been reluctant in the past to take a diuretic because of concerns regarding excessive voiding. The physician explains that urine volume is more dependent on fluid intake and less on the diuretic after the first 2 or 3 weeks of therapy. This assuages her concerns sufficiently for her to try diuretic therapy. The physician prescribes 12.5 mg HCTZ daily (one-half 25 mg tablet daily), with plans to titrate the dosage to 25 mg daily in 4 to 6 weeks. Because of the constipation, the verapamil is discontinued. The physician also recommends that the patient monitor her blood pressure at home and record her measurements in a log book. He asks her to bring the book to her next visit.

- **What is the goal systolic blood pressure when treating older patients?**

The goals for systolic blood pressure control in older patients remain the same as goals for blood pressure treatment in younger patients. For patients with severe systolic elevations, the National High Blood Pressure Education Program suggests a temporary systolic goal of 160 mm Hg [21]. In most
patients the systolic blood pressure treatment goal is less than 140 mm Hg. In higher risk patients, such as those with diabetes or proteinuria (greater than 500 mg daily), a systolic blood pressure goal of less than 130 mm Hg (diabetes) or less than 125 mm Hg (proteinuria) is recommended to reduce further the risk for cardiovascular and renal disease [3].

An additional consideration to keep in mind is that current blood pressure goals may need further revision when target organ damage is present. This was supported by the recent PROGRESS study, which showed that the combination of an ACE inhibitor with diuretic therapy reduced the likelihood of a second stroke when a first stroke had already occurred, even in normotensive individuals [39].

**• What is an acceptable degree of systolic blood pressure control?**

Systolic blood pressure control is unlikely to reach 100% of guideline recommendations. The recent CONVINCE data suggest that achieving a blood pressure of less than 140 mm Hg in 60% of patients is a realistic level of systolic control [40]. In our experience, we are usually able to decrease an elevated systolic pressure to less than 160 mm Hg about 85% of the time and to below 140 mm Hg about 60% of the time [31]. The measures we have found most useful are to initiate or manipulate a diuretic regimen, add or adjust a dihydropyridine calcium channel blocker, and add or adjust an angiotensin receptor blocker [41].

**Follow-up at 4 Weeks**

Blood pressures (not averaged) in the right arm with the patient in a seated position are 156/72 and 158/72 mm Hg. Her home blood pressure values also reflect improvement. The physician verifies the accuracy of her home UA AND 767 monitor and her technique. However, she relates significant dismay over how she feels on the diuretic, and has read the package insert prepared by the pharmacist for her. She produces the package insert, which has multiple areas highlighted in yellow marker. She also feels she is “going to the bathroom too often.” The physician reviews these issues with her, and although satisfied with the answers, she is still reluctant to continue the HCTZ. Felodipine 5 mg daily is substituted. A careful review of calcium channel blocker side effects is undertaken with her prior to her leaving the office.

**At 10 Weeks**

Blood pressures (not averaged) in the right arm with the patient in a seated position are 168/84 and 160/82 mm Hg. Heart rate is 64 bpm. At-home readings average approximately 150 mm Hg. The felodipine dosage is increased to 10 mg daily. The physician informs her that it is likely that an additional agent will be necessary to supplement the felodipine and metoprolol-XL and instructs her to call in her blood pressures in 2 weeks after the increase to 10 mg of felodipine. He also tells her that he would likely choose an angiotensin receptor blocker such as losartan or valsartan and reviews the side effect profiles of these agents with her. An appointment is scheduled for another 4 weeks.

She calls with interval blood pressure values after 2 weeks, which though slightly better, are still short of goal, and valsartan 80 mg daily is added.

**At 14 Weeks**

Blood pressure readings and heart rate are as follows:

<table>
<thead>
<tr>
<th>Position</th>
<th>Right Arm</th>
<th>Heart Rate</th>
</tr>
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<tbody>
<tr>
<td>Sitting</td>
<td>132/60</td>
<td>64</td>
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<tr>
<td>Sitting</td>
<td>130/60</td>
<td></td>
</tr>
<tr>
<td>Standing</td>
<td>136/66</td>
<td>62</td>
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Blood pressure control is reasonable with the combination of felodipine 10 mg daily, valsartan 80 mg daily, and metoprolol-XL 50 mg daily. No further changes are made in her regimen. An appointment is scheduled for 3 months to assess maintenance of blood pressure control.

**• What are the interesting points of this case?**

Several issues in this case are worth reviewing. First, a long-acting dihydropyridine calcium channel blocker (felodipine) was substituted for a phenylalkylamine calcium channel blocker (verapamil). Although this change would seem unlikely to result in a significant reduction in blood pressure, the combination of β blocker with a dihydropyridine calcium channel blocker in our experience has been generally more effective than the combination of nondihydropyridine calcium channel blocker therapy with β blockade.

It was frustrating to abandon HCTZ therapy in this patient, but it was clear that she had serious concerns about side effects, and the package inserts summarizing 40 years of experience with thiazide therapy in literally millions of patients treated can be quite daunting. Because there were acceptable alternative therapies, however, stopping HCTZ therapy seemed the wiser choice.

The patient’s ability to measure blood pressure was verified in the office, and her therapy was altered outside the office because we trusted her readings and had discussed the option before hand and she agreed to this approach.
Growing support for home monitoring is evident by the frequency with which hypertensive patients perform home blood pressure measurements. When done properly, such measurements can add to patient compliance and understanding [42]. An ongoing study is evaluating the benefit of home- versus office-based blood pressure management [43].

**Conclusion**

Hypertension remains one of the most treatable risk factors for cardiovascular disease. In the elderly especially, when the lifetime accumulation of risk factors for cerebral and cardiac disease become increasingly troubling, antihypertensive therapy is critically important. The risks from high blood pressure are offset, in part, by the fact that older patients are more likely to derive benefit from blood pressure treatment than younger patients [44].

**References**


25. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. The Trials of Hypertension Prevention, phase II. The Trials of Hypertension Prevention Collaborative Research Group. Arch Intern Med


