Assessment of the Treatment of Hypertension in a University HMO Ambulatory Clinic

Sara D. Brouse, PharmD, Bryan F. Yeager, PharmD, BCPS, and Aimee R. Gelhot, PharmD

• Objective: To determine the adequacy of hypertension treatment for patients enrolled in a university health maintenance organization (HMO).
• Design: Retrospective review of medical records.
• Patients and setting: 182 patients with an ICD-9 diagnosis code for benign essential hypertension seen between October 1995 and October 1997 in internal medicine and family practice clinics.
• Methods: Blood pressure measurements, length of time between follow-up visits, initial and current drug therapy, and nonpharmacologic therapy were recorded. Recommendations for blood pressure control (<140/90 mm Hg), staging of hypertension, follow-up times, and initial therapy (β blocker or diuretic, when appropriate) were based on Joint National Committee (JNC) guidelines.
• Results: Antihypertensive therapy was prescribed for 96% of study patients. Blood pressure was controlled to less than 140/90 mm Hg in 38.2% of patients during the study period. Diuretics or β blockers were initially selected for 44% of patients. Time to follow-up visits for hypertension was in accordance with JNC recommendations 48.9% of the time.
• Conclusion: Within a university HMO patient population, blood pressure control exceeded a national estimate of 29% control in hypertensive patients (NHANES-III survey). Further improvements can be made in nonpharmacologic management of hypertension, initial choice of drug therapy, blood pressure control, and time to follow-up.

Since the early 1900s, cardiovascular disease has been the number one cause of death in the United States [1]. Approximately 43 million U.S. adults (24%) have hypertension, an important risk factor for heart disease [2]. The annual costs of treating hypertension and its sequelae are staggering, estimated at $18.7 billion for treating hypertension alone and $138 billion for treating cardiovascular disease [3,4].

According to Joint National Committee (JNC) guidelines [5,6], high blood pressure should ideally be controlled to less than 140/90 mm Hg to minimize complications from uncontrolled hypertension such as stroke, renal disease, and heart failure. β Blockers and diuretics have been shown to decrease morbidity and mortality associated with cardiovascular disease and remain first-line antihypertensive therapy for patients with hypertension [5–7].

National Health and Nutrition Examination Surveys (NHANES) have been conducted periodically since 1960 to estimate hypertension prevalence and to determine the status of hypertension awareness, treatment, and control in the U.S. adult population. The NHANES-III survey Phase I (1988–91) [2] conducted in a representative sample of nearly 10,000 men and women aged 18 to 74 years found that only 29% of subjects with hypertension were controlled to the goal blood pressure of less than 140/90 mm Hg. Blood pressure control was achieved in 45% of patients treated with antihypertensive medications. Preliminary data from the NHANES-III survey Phase II (1991–94) suggest that only 27.4% of hypertensive patients were controlled during the study period. Although blood pressure control nationwide has increased over the past 3 decades [8], it still lags behind the Healthy People 2000 goal of increasing to at least 50% the proportion of hypertensive patients whose blood pressure is controlled [9].

Compiled data from a university health maintenance organization (HMO) in Kentucky suggest that hypertension is a common problem among the patient population. Kentucky resides within the “coronary valley,” a belt that stretches between the Ohio and Mississippi River valleys that has one of the highest death rates in the country due to coronary...
artery disease [10]. Cardiac medications (including antihypertensive agents) have ranked second among all drug classes in overall drug costs for the past decade at the HMO; however, blood pressure control, antihypertensive selection, and follow-up care in this population have not been previously assessed. This evaluation was conducted to assess the adequacy of treatment for patients with uncomplicated hypertension enrolled in a university HMO.

**Methods**

Patients included in the study were enrolled in the university HMO between October 1995 and October 1997 and had a primary diagnosis of benign essential hypertension (ICD-9 diagnosis code 401.1) for which they were receiving treatment through the university-affiliated internal medicine or family practice clinics. Patients were excluded if they had a comorbid condition that may alter blood pressure, including renovascular or renovascular renal disease, polycystic kidney disease, thyroid disease, Cushing’s syndrome, pheochromocytoma, pregnancy, aortic coarctation, brain tumor or organic brain disease, primary aldosteronism, or hyperparathyroidism. Patients also were excluded if they were receiving medication that may alter blood pressure, including estrogen (oral contraceptives), amphetamines, immunosuppressive agents (tacrolimus, steroids, cyclosporine), erythropoietin, or nonsteroidal anti-inflammatory agents. Patients with comorbid conditions that may alter antihypertensive drug therapy options (eg, documented coronary artery disease, diabetes) also were excluded.

A retrospective chart review was conducted to determine patients’ blood pressure control, antihypertensive medications, length of treatment, coexisting disease states, social history, initial antihypertensive medications (if available), and time to follow-up between outpatient visits for hypertension. Hypertension was defined as either a systolic blood pressure greater than or equal to 140 mm Hg or a diastolic blood pressure greater than or equal to 90 mm Hg, or current use of antihypertensive medications, as defined by JNC guidelines and as in the NHANES-III survey [2,5,6]. Documentation of lifestyle modifications (ie, dietary changes, exercise) had to be present in the chart if patients were not receiving therapy with antihypertensives. Hypertension control was defined as a blood pressure of less than 140/90 mm Hg. If either the systolic blood pressure or diastolic blood pressure was within range and the other was not, the patient was considered to have uncontrolled hypertension. Patients with elevated blood pressure during a visit had to have at least 2 measurements to confirm the reading. Patients with a normal or high-normal blood pressure (less than 140/90 mm Hg) after 1 reading did not need to have an additional measurement to confirm the reading.

Patient data were collected up to 2 years prior to the patient's last documented clinic visit. Appropriate follow-up for patients diagnosed with hypertension was defined by JNC guidelines. If the hypertension was uncontrolled during a clinic visit and/or a medication change was required, follow-up within 1 to 2 months was considered standard of care. Stable patients should have had a follow-up appointment every 3 to 6 months, regardless of changes in therapy, to ensure continued hypertension control [5,6].

The primary endpoint measured was blood pressure control. Secondary endpoints included time to follow-up for hypertension-related events, initial antihypertensive selection, incidence of outpatient and emergency department visits related to hypertension, and the use of lifestyle modifications.

**Results**

After reviewing ICD-9 diagnosis codes for patients enrolled in the HMO, 207 patients were selected for review. These patients had isolated benign essential hypertension and were without ICD-9 diagnosis codes for comorbid conditions that would have excluded them from the study. After chart review, 25 (12%) patients were excluded for the following reasons: 14 had thyroid disease (6.8%), 3 were on oral contraceptives (1.4%), 3 had charts that contained incomplete data (1.4%), and 5 had charts that could not be located (2.4%). Of the 182 patients included in the study, 118 patients were seen in the internal medicine clinic and 64 were seen in the family practice clinic (Table 1).

As of the most recent clinic visit, hypertension was controlled in 48.7% of patients studied (Figure 1). However, hypertension control during the entire 2-year study period was only 38.2%. The time to follow-up was consistent with JNC guideline recommendations in 48.9% of patients. Lifestyle modifications were documented in 57% of the charts: 30% of patients were using both diet and exercise to

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<tr>
<th>Table 1. Demographics</th>
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<td>Mean age, yr</td>
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<tr>
<td>Age range, yr</td>
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<tr>
<td>Mean duration of</td>
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<td>hypertension, yr</td>
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<tr>
<td>Male</td>
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<tr>
<td>Female</td>
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<tr>
<td>White</td>
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<tr>
<td>African American</td>
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control blood pressure, 15% of patients were modifying their diet only, and 12% of patients were using exercise only (Figure 2).

A number of hypertension medications were utilized in the internal medicine and family practice clinics. Forty-four percent of all study patients were initially treated with either a β blocker or diuretic, 26% of patients were started on an angiotensin-converting enzyme (ACE) inhibitor for hypertension treatment, and 24% of patients were started on a calcium channel blocker (Table 2). The remainder of patients were started on other agents, such as angiotensin II-receptor antagonists. The antihypertensive medications utilized as of the most recent clinic visit included ACE inhibitors (38%), β blockers (20%), calcium channel blockers (29%), diuretics (35%), and other antihypertensive classes (10%). Nonpharmacologic lifestyle modifications were used as the sole hypertension therapy in 7.5% of patients at their last clinic visit.

Twenty-seven percent of patients were on more than 1 antihypertensive agent at their most recent clinic visit. The most common combination of medications was an ACE inhibitor with a diuretic. Patients had a change in medication drug class utilized for hypertension treatment an average of 1.6 times during the 2-year study period. The reasons documented for discontinuation of the initial medication or addition of an antihypertensive agent to the existing regimen were as follows: 56.2% of patients were poorly controlled, 25.5% had an adverse drug reaction, and 5.1% were identified as having a concurrent disease state that was more appropriately treated with another agent. The reason for discontinuation was unknown for the remainder of patients. There was no difference in incidence of adverse drug reactions among the drug classes studied in both the internal medicine and family practice groups. Internal medicine patients had a similar incidence of poor control among each individual drug class, but family practice patients were more poorly controlled on diuretic therapy than on any other therapy. Only 1 emergency department visit was documented due to a hypertensive emergency during the study period.

Discussion

As our study and others show, many patients with hypertension have inadequate control of their blood pressure [8,11]. Possible reasons for this include failure to emphasize the importance of lifestyle modifications, inadequate drug titration, failure to use drugs in combination when indicated, and patient nonadherence [12]. Factors associated with nonadherence include a complicated drug regimen, perceived barriers to treatment of hypertension, adverse drug reactions, and the high cost of drug therapy [13].

Much stands to be gained from improving control of hypertension. Randomized controlled studies have shown that over a 5-year period, a 5– to 6-mm Hg reduction in
Diastolic blood pressure is accompanied by a 25% reduction in the incidence of coronary artery disease, a 40% reduction in the incidence of stroke, and a nearly 50% reduction in the incidence of congestive heart failure [1,14–16]. Yet in a university HMO hypertensive population, only 38.2% achieved blood pressure control consistent with national guideline recommendations (less than 140/90 mm Hg). Our results are similar to the findings reported in NHANES-III. Although our rate of control is higher than the 29% control rate reported in NHANES-III survey, the difference is not statistically significant, and the difference may be attributed to the normal variation in blood pressure control among the U.S. population. Further, blood pressure control noted in treated hypertensive subjects with or without comorbidities in the NHANES-III survey was greater than in our group of uncomplicated hypertensive patients (45% versus 38.2%). Our study also showed that only 44% of patients were initially started on a β blocker or diuretic despite JNC guidelines that designate these drugs as first-line therapy for the patient population studied.

We limited our study population to hypertensive patients without concomitant disease states that may have influenced hypertension control or the antihypertensive medication chosen for treatment. Patients with comorbidities were excluded because our study was a descriptive pilot analysis to determine the adequacy of hypertension control in university HMO patients. As patients with comorbid conditions are difficult to study retrospectively due to confounding factors, we felt that they should be studied separately. A future study is planned to evaluate hypertension treatment and control in university HMO patients with comorbidities.

Although the subjects enrolled in the NHANES surveys were not excluded if they had comorbidities and were not stratified by type of health care coverage, we feel that it is reasonable to compare NHANES-III findings with our study findings. The proportion of patients from specific age and racial groups in NHANES-III is similar to the breakdown of age and racial groups within our university HMO study group [2]. The definitions of hypertension, hypertension treatment, and hypertension control used in our study were identical to those in NHANES-III. Mercury sphygmomanometers were utilized in both the NHANES-III and our university HMO clinic to measure blood pressure [2]. The NHANES surveys documented multiple blood pressure measurements on 2 separate occasions to determine

### Table 2. Initial Hypertension Therapy

<table>
<thead>
<tr>
<th></th>
<th>Internal Medicine (n = 118)</th>
<th>Family Practice (n = 64)</th>
<th>Total (n = 182)</th>
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<tbody>
<tr>
<td>Diuretic</td>
<td>22</td>
<td>29</td>
<td>28%</td>
</tr>
<tr>
<td>ACE inhibitor</td>
<td>37</td>
<td>11</td>
<td>26%</td>
</tr>
<tr>
<td>Calcium channel blocker</td>
<td>31</td>
<td>12</td>
<td>24%</td>
</tr>
<tr>
<td>β Blocker</td>
<td>19</td>
<td>10</td>
<td>16%</td>
</tr>
<tr>
<td>Other antihypertensive class</td>
<td>9</td>
<td>2</td>
<td>6%</td>
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![Figure 2. Lifestyle modifications made by study patients as documented in medical charts.](image)
the true reading [8]. In our retrospective study, patients found to be hypertensive were included only if a blood pressure greater than 140/90 mm Hg was confirmed on another occasion.

Because this was a retrospective study, the data collected were limited to the documentation obtainable in the chart. Some of the parameters measured, such as use of lifestyle modifications or medication compliance, may have been underestimated. Often, a patient had a medication change for an unclear reason. We were unable to analyze pharmacy records and medication adherence. Despite these limitations, we feel our study method allowed us to collect sufficient data to accurately assess how hypertension is being managed in the ambulatory care clinic of a university HMO and to compare our findings with those from a larger population survey.

What approaches may be likely to improve hypertension control? Berlowitz and colleagues [11] found that patients who received more intensive medical therapy, with more frequent visits and blood pressure checks, had better control. Thus, changing physician management practices, with closer follow-up than that recommended by JNC guidelines, could improve efficacy of care. The National Coalition for Quality Assurance (NCQA), the accrediting body for HMOs, will introduce a HEDIS measure on controlling blood pressure in HEDIS 2000 that will report the percentage of members diagnosed with hypertension who are controlled to below 140/90 mm Hg. The availability of performance information to consumers could help lead to better outcomes for patients with hypertension [17]. Intensive provider education on use of β blockers and diuretics in the treatment of uncomplicated hypertension and patient education regarding the complications of uncontrolled disease and the importance of lifestyle modifications and adherence to drug therapy may also be beneficial. More aggressive titration of antihypertensive medications and consideration of combination therapy might improve control [18,19]. Prospective clinical trials assessing innovative practice models for optimizing hypertension management are needed.

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