Profile of Hypertensives as a Determinant of Long-Term Antihypertensive Medication Needs

Shantha Madhavan, M.S., Toni Davis, M.S., and Michael H. Alderman, M.D.

SUMMARY  The experience of 110 hypertensives who participated in a worksite stepped-care treatment program has been examined to draw a patient profile at entry that would determine medication needs on a long-term basis. Patients entered untreated with a blood pressure (BP) level of ≥ 160 mm Hg systolic and/or ≥ 95 mm Hg diastolic (DBP) and had a minimum follow-up of 1 year. Treatment was initiated with diuretics, and additional drugs were added as necessary to achieve BP control. Patients were divided into three groups according to initial DBP levels: Group A (33 patients, ≥ 105 mm Hg), Group B (43 patients, 95–104 mm Hg), and Group C (34 patients, < 95 mm Hg). Using a life table method, we analyzed the therapeutic experience of these patients to obtain 5-year cumulative rates of adding a second drug to diuretics. Within the first 2 years of treatment, the cumulative rates were: 64% in Group A, 33% in Group B, and 23% in Group C. In all three groups the rates after the second year remained stable. This stepped-care approach resulted in BP control (< 160/95) which ranged from 78% in the first year to 96% in the fifth year.

Findings suggest that initial DBP level and age are principal factors in determining medication needs. Furthermore, at higher DBP levels, younger nonwhite and younger white males are most likely to require a second drug within the first year of treatment. The need for a second drug is apparent within the first 2 years.

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KEY WORDS  • stepped care • hypertension • diuretics • drug regimen

A widely recommended approach to the attainment of blood pressure (BP) control has been the incremental application of increasing amounts of drugs beginning with a diuretic. Although this “stepped-care” technique has been adopted in a group of newly treated hypertensives who pursued a variety of settings with substantial effect, there is little information about the details of its actual application in general populations.

We have therefore examined the experience of a group of newly treated hypertensives who pursued a systematic stepped-care approach for up to 5 years. We now report the degree of BP control observed with this pattern of therapy, the type and timing of drug use among different subgroups of patients, and the incidence of metabolic abnormalities.

Material and Methods

Records of participants in a union-sponsored worksite-based hypertension detection and treatment program which began in May, 1973, in New York City have been reviewed. Patients included in this study entered the program between August, 1973, and July, 1978, had at least 1 year of follow-up, and had a BP level of ≥ 160 mm Hg systolic and/or ≥ 95 mm Hg diastolic at each of three consecutive pretherapy visits. Study patients were not already receiving antihypertensive therapy, and their first drug in this program was 25 mg of a diuretic. Of 347 hypertensive patients, 110 met the study selection criteria.

The treatment plan in the stepped-care protocol was to start with a diuretic and to add a second drug, either methyl dopa or propranolol, followed by hydralazine as the third drug.

Patients were divided into three groups according to initial diastolic blood pressure (DBP) levels at entry: Group A (≥ 105 mm Hg), Group B (95–104 mm Hg), and Group C (< 95 mm Hg). There were 33, 43, and 34 respectively in each group. For each patient, yearly average BP levels were computed from the BP measurements recorded as an average of two readings at each clinic visit. A patient was considered to have achieved BP control if the yearly average BP level was < 160/95 mm Hg. Observed drug regimens were: 1) diuretic alone; 2) a second drug added to the diuretic; 3) a third or fourth drug; 4) substitute drug for the diuretic; and 5) withdrawal of all medication.

Using the life table approach, we constructed curves for 5-year cumulative rates of adding a second drug to diuretics for each patient Group A, B and C as well as the total. All 110 patients entered the life table with a common drug status (diuretics alone). A patient made an exit from the diuretic alone status when: 1) receiving a second drug; 2) changing to diuretic substitute; 3) withdrawing from medication; 4) becoming lost to follow-up; or 5) withdrawing from observation. The first exit is the event for which cumulative rate is estimated. For the remaining four types of exit, we assumed that these patients were exposed to the risk of adding a second drug for one-half the year in which they made the exit. Limited by small numbers of patients, we found that construction of curves with factors sex, race, and age as covariates was not possible. Yearly laboratory values were also available in the analyzed data set.

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Results

Initial characteristics of the patients reveal that the study group generally reflected the total treated population. There were more than twice as many females, and 2.5 times as many white as nonwhite participants. Slightly more than one-third of the persons were under 55 years of age and over 40% between the ages of 55 through 64 years, whereas one-fifth were 65 years old or older. The initial mean blood pressure reading for the entire group was 176.1/99.6 mm Hg. The mean length of follow-up was 4.25 years, with 50% being observed for 5 years.

All patients had at least 1 year of follow-up. An average of 7.1% of the patients were lost at each of the subsequent 4 years. The percentage of total lost patients was similar in all three groups: Group A (27.3); B (30.2); and C (26.5). By the end of the fifth year, 31 (28%) of the patients were lost to the study. Twenty-four (21.8%) patients were withdrawn from observation as of the cutoff date. Those patients who were lost or withdrawn had similar demographic characteristics and BP values as the total group.

In figure 1, patients have been charted in the three initial DBP groups by mean systolic and mean diastolic pressures. Of these, Group C had an initial level (176.7 mm Hg) between A (192.2 mm Hg) and B (164.8 mm Hg) as the patients in this group initially had high systolic but diastolic pressures of < 95 mm Hg. A steep fall occurred in the first year for both systolic and diastolic pressures. In the second year, there was a small further decline; thereafter, the BP stabilized. By the end of the first year of treatment, the average pressures in all three groups were < 160/95 mm Hg and all except Group A had average levels < 145/90 mm Hg. By the first year, 78.2% of all patients achieved BP control, and by the fifth year the percent controlled rose to 96.4%.

After the second year, percentages in the second drug category seemed to stabilize, and use of diuretics alone gradually diminished.

Figure 2 illustrates the distribution and mean age of patients with DBP at entry ≥ 95 mm Hg by their drug

Table 1 shows the two major categories of drug status of controlled patients by year of follow-up: 1) diuretics alone; and 2) diuretics plus a second drug (i.e., adding second drug to diuretics or continuing on this regimen). In the first year, 81.4% were on diuretics alone and only 10.9% were in the second category.

**Figure 1. Blood pressure levels of patients by diastolic blood pressure at entry and year of follow-up.**

**Figure 2. Percent of patients adding a second drug to diuretics by diastolic blood pressure at entry.**
status within the first 2 years, sex, and race. In every sex-race category, younger patients tended to have a second drug added. Nonwhite females had the highest percent (60.0%) followed by white males (42.1%), then white females (38.0%) and lastly the nonwhite males (20.0% based on only seven patients). The overall mean ages of nonwhite females and white males were younger than the other two groups of patients. One nonwhite female whose medication was withdrawn was not included in this distribution.

Five patients, ultimately required three drugs including a diuretic to achieve BP control. All five had a DBP of $\geq 105$ mm Hg at entry.

Data on the blood chemistries known to be influenced by diuretics (cholesterol, BUN, potassium, uric acid, and blood glucose) were analyzed at the start of the study and after the first and fifth years. In spite of some significant changes in the mean values over the 5 years, the levels lie well within a clinically acceptable normal range. A review of the patients' charts revealed no major metabolic changes or severe drug toxicities.

**Discussion**

Application of a stepped-care program among hypertensive patients drawn from a working population resulted in the attainment of BP control by nearly 80% of the patients within the first year and ultimately by 96%. This therapeutic regimen was associated with negligible toxicity, and a high degree of patient acceptance. Results of the analysis revealed that, while a single drug seemed satisfactory for nearly 80% in the initial year, 39% were likely to have a second drug added to diuretics by the second year of follow-up, and ultimately 44% were treated with additional medication.

Closer analysis of the patterns of medication use reveals that the needs of the patients were most strongly influenced by initial BP levels. Thus, patients who had an initial DBP of $\geq 105$ mm Hg were roughly twice as likely to need at least a second drug as those whose initial DBP was below that level. Moreover, although only five of the total of 110 patients needed a third drug, all of these had DBP $\geq 105$ mm Hg. Although more and more patients achieved BP control over time, the pattern of medication needs appeared to stabilize after the first 2 years of treatment. Most patients thereafter seem to remain with either a single drug (diuretic) or a diuretic plus a second drug.

The profile of patients from whom these data were drawn indicates that, in addition to initial BP, important factors in determining the therapeutic course are sex, race, and age. The younger the patient, the more likely a second drug would be required in addition to diuretics. Furthermore, a younger nonwhite female or younger white male with a high DBP level would be most likely to have a second drug added within the first 2 years of therapy.

The experience of these systematically treated patients indicates that maintenance of BP control over time demands increasing drug exposure for those with mild as well as with more severe elevations. Clinicians and public health practitioners must take into account the economic as well as pharmacologic implications of these findings as the national campaign to control hypertension expands.

### References


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**TABLE 1. Drug Status of Controlled Patients by Year of Follow-Up**

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*Controlled patients with blood pressure levels $<160/95$ mm Hg.
†Drug Status: 1 = diuretic alone; 2 = diuretic plus a second drug; 3 = other drug status (diuretics plus two drugs; diuretic substitute; no medication).

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**FIGURE 3.** Percent distribution and mean age of patients with diastolic blood pressure at entry $\geq 95$ mm Hg by sex, race, and drug status.
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