

The Determinants of Hypertension Awareness, Treatment, and Control in an Insured Population

ABSTRACT

Objectives. The purpose of the study was to identify the determinants of awareness, treatment, and control of hypertension in a population with full access to medical care.

Methods. Unionized New York City health care workers (n = 1394) with comprehensive medical insurance were screened for hypertension. Union records documenting all physician visits and prescription medications for the year before screening provided the opportunity to relate patterns of treatment to blood pressure outcomes.

Results. Of the 409 employees found to have hypertension, 289 (71%) were aware of their condition and 201 (49%) had been treated, but only 51 (12%) had their blood pressure controlled at the recommended level (<140/90 mm Hg). In a logistic regression model, the only variable of treatment associated with control was days of antihypertensive medication. The total number of physician visits was not associated with control.

Conclusions. These findings demonstrate that in conventional community settings, even in the absence of financial barriers, treatment for hypertension continues to be characterized by poor outcomes. Improving access to primary care, without changes in the nature of that care, may not substantially improve blood pressure control. (*Am J Public Health*. 1994;84:1768-1774)

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Introduction

Mortality due to cardiovascular disease has declined dramatically over the past 20 years in parallel with growing efforts to control hypertension. Indeed, treatment of high blood pressure is now the most common reason to visit a physician.¹ But despite sharp increases in patients' awareness of and participation in antihypertensive treatment, national data indicate that fewer than 25% of all hypertensive persons currently meet the recommended blood pressure goal of less than 140/90 mm Hg.²

Lack of access to primary medical care has been identified as an important cause of this persistent failure to control hypertension.^{3,4} Indeed, many believe that the attainment of universal access to primary care physicians through national health care reform will reverse this longstanding and widespread inability to bring high blood pressure under control. These expectations, however, continue to depend on a system of primary care that has in the past been inadequate to the task.⁵⁻⁷

This study was undertaken to assess the current extent of awareness, treatment, and control of hypertension and to identify the determinants of these outcomes in a population of unionized health care workers. These employees enjoyed full access to health care as currently delivered in the community. They represent a socioeconomically homogeneous, multiethnic, well-educated population with comprehensive medical benefits who actively used the array of health care providers and services available. Union medical payment records, which cover all physician visits and prescription medications for the year before blood pressure screening, provided the opportunity to determine how different aspects of care

were associated with awareness, treatment, and control of high blood pressure.

Subjects and Methods

Subjects

The subjects were 1394 members of the 1199 National Health and Human Services Employees Union who voluntarily participated in blood pressure screenings from August through November of 1992. The screenings took place at four sites, two of which were hospitals in the Bronx and two of which were union offices in Manhattan. Since there were no significant differences between the Bronx and Manhattan sites in subjects' awareness, treatment, or control of high blood pressure, the experience of all 1394 employees was pooled. An additional 192 screenees were not union members or were not eligible for full health benefits and were therefore excluded from the analysis.

Blood pressure was recorded by a trained nurse or technician using a standard sphygmomanometer. The recorded blood pressure was the average of the second and third readings from a set of three consecutive seated right-arm measurements. Employees were defined as having hypertension if they had a diastolic blood pressure of 90 mm Hg or higher and/or a systolic blood pressure of 140 mm Hg or higher or if union records

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indicated that they had taken antihypertensive medication within a year of screening. This report focuses on the 409 employees who met these criteria.

Information obtained at the screening included sex, race, age, height, weight, years of school completed, and marital status. Marital status was found not to be significant in terms of blood pressure outcomes and was excluded as a variable in the analysis. Screenees were also asked, Have you ever been told that your blood pressure was high? and Have you ever visited a doctor because of high blood pressure? Awareness of hypertension was defined as a positive answer to either question. Treatment was assessed from union records, was limited to antihypertensive medication, and did not include nonpharmacological interventions. By definition, those whose blood pressure was controlled must have been treated, and those who were treated must have been aware (Figure 1).

All 1394 employees worked more than 20 hours per week and were therefore eligible for comprehensive health care benefits from the union, including all charges for physician visits, hospital visits, prescription medications, vision care, and dental care. Union members are not required to make copayments or meet deductible amounts unless they use non-panel physicians.⁸ Visits to nonpanel physicians account for 45% of all physician visits, but on average, union members pay less than 5% of the charges for these nonpanel visits. Because the union's benefit fund reimburses health care providers for all services, union records include all health care provided to the more than 99% of its members who use the plan exclusively (internal union documents, April 1992 and January 1992).

Physician and prescription histories obtained from union records included all claims made from December 1, 1991, through November 30, 1992, roughly the year before the blood pressure screenings. Because screening began in August 1992, the records for some employees included up to 3 months that took place after screening.

Physician visits are recorded for the union by a private contractor, the Erisco Corporation, which maintains an administrative database. Diagnoses for each physician visit are classified according to the *International Classification of Diseases*, 9th Revision (ICD-9).⁹ Physician visits included everything from routine physicals to surgical procedures in all fields except dentistry. The visits took place in a variety

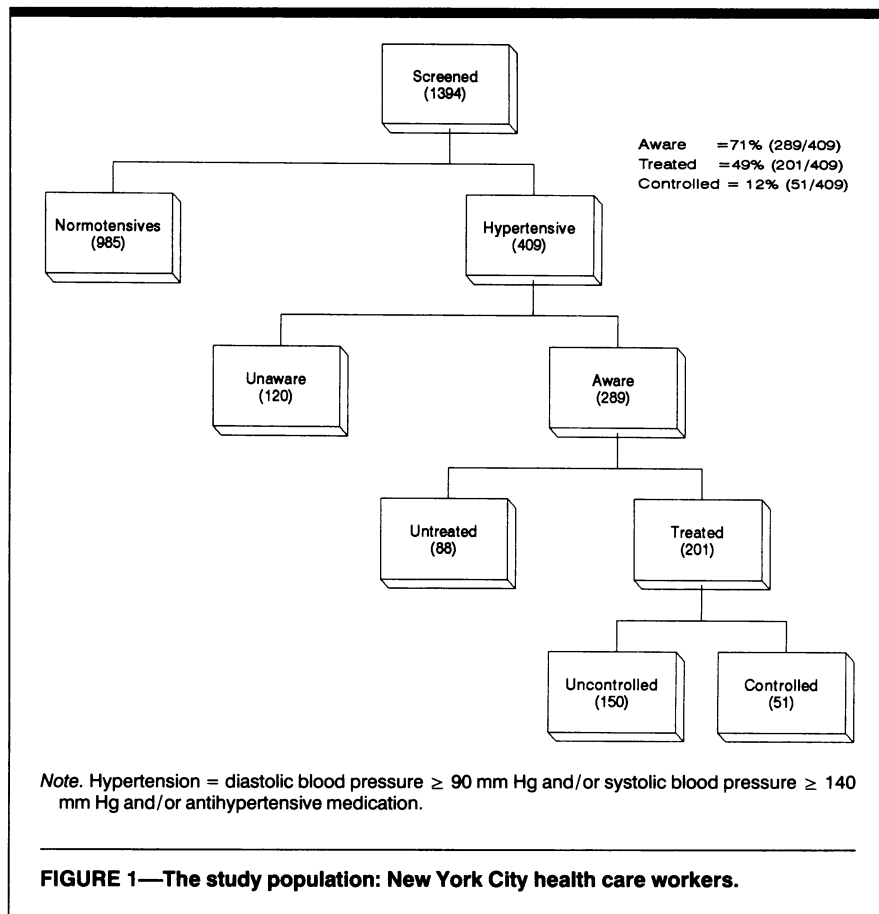


FIGURE 1—The study population: New York City health care workers.

of settings, including private offices, clinics, and hospitals. Visits to a physician for the purpose of treating hypertension were identified by ICD-9 codes 401–405.

Prescription medications are recorded for the union by the National Pharmacy Administration. These records represent prescriptions that are actually filled at a pharmacy and paid for by the union. Antihypertensive medications were sorted into six classes or drug types: ACE inhibitors, beta blockers, calcium channel blockers, diuretics, α_1 blockers, and central α_2 agonists. Drug use was measured not in milligrams or numbers of pills, but in days of drug provided (drug days). Thus, a prescription for 60 pills to be taken twice daily counted as 30 drug days. Since drug days were not the same as calendar days, it was possible for a person who took multiple antihypertensive medications to have more than 365 drug days in the year under study. Combination antihypertensives were treated as two drug types but as single medications in terms of drug days. For example, 30 days' worth of Capozide counted as 30 drug days and as two drug types: an ACE inhibitor (captopril) and a diuretic (hydrochlorothiazide).

Statistical Methods

We used univariate analyses of baseline characteristics and selected treatment measures to compare the unaware with the aware group, the untreated with the treated group, and the uncontrolled with the controlled group. The significance of association between each categorical variable and each outcome variable was assessed by chi-square test. Because the distributions of the selected treatment measures tended to be skewed, differences between mean values were tested by the nonparametric Mann-Whitney test. We constructed multiple logistic regression models using a stepwise procedure with forward selection to identify factors independently associated with each of the outcome variables. All statistical analyses were performed with SPSS/PC+ and Egret software.^{10,11}

Results

Of the 409 employees found to be hypertensive at screening, 289 (71%) were aware of their high blood pressure, 201 (49%) had received treatment, and only 51 (12%) had achieved a blood pressure of less than 140/90 mm Hg (Figure 1). Table 1

TABLE 1—Baseline Characteristics (%) of Subjects, by Hypertension Awareness, Treatment, and Control

	Awareness		Treatment		Control	
	Unaware (n = 120)	Aware (n = 289)	Untreated (n = 88)	Treated (n = 201)	Uncontrolled (n = 150)	Controlled (n = 51)
Female	48.3	60.2*	44.3	67.2*	60.7	86.3*
Age:						
45–74 y	52.5	74.7*	59.1	81.6*	80.7	84.3
Race						
Black	45.8	59.8*	52.4	63.2	61.5	68.1
White	33.6	21.2	20.7	21.4	20.0	25.5
Hispanic	20.6	18.9	26.8	15.4	18.5	6.4
Body mass index: ≥ 29 kg/m ²	26.7	43.5*	28.6	50.0*	49.7	51.0
Education: > 12 y	55.7	44.3	50.6	41.5	45.2	31.3

*Significant ($P < .05$ from chi-square test).**TABLE 2—Selected Treatment Measures, by Hypertension Control**

	Uncontrolled (n = 150)			Controlled (n = 51)			P^a
	Mean	SD	Median	Mean	SD	Median	
No. of physician visits/y	9.6	9.4	7	10.4	7.8	9	.170
No. of physician visits for hypertension/y	1.8	2.4	1	2.6	3.3	1	.092
No. of antihypertensive drug days/y	250	197	210	320	228	271	.030
No. of antihypertensive drug types/y	1.6	0.8	1	1.8	0.9	2	.059

^aFrom Mann-Whitney test between means.

shows the baseline characteristics of these employees according to their awareness, treatment, and control.

Awareness, Treatment, and Control

Those who were aware of their high blood pressure were more likely to be female, Black, older, and obese (by body mass index) than those who were unaware (Table 1). A lower education level was marginally associated ($P = .054$) with a greater degree of awareness.

In addition, the aware group had more physician visits per year than the unaware group (mean [SD] = 8.6 [9.2] vs 6.4 [8.8], $P = .002$; median = 6 vs 4). However, this difference was entirely accounted for by the high number of physician visits made by those in the aware group who were also treated for their hypertension. When this treated group was excluded, the aware group no

longer had more physician visits per year than the unaware group (mean [SD] = 5.7 [9.1] vs 6.4 [8.8], $P = .430$; median = 3 vs 4). Therefore, among the untreated patients, a larger number of physician visits did not lead to greater awareness.

Of the 289 employees who were aware of their hypertension, those who were treated were more likely to be female, older, and obese than those who were untreated (Table 1). As noted above, the treated group also had more physician visits per year than the untreated group (mean [SD] = 9.8 [9.0] vs 5.7 [9.1], $P < .001$; median = 7 vs 3).

Of the 201 employees treated for their hypertension, those whose blood pressure was controlled were more likely than those in the uncontrolled group to be female (Table 1). The controlled group had a significantly larger number of

antihypertensive drug days than the uncontrolled group (Table 2). The percentage of subjects whose blood pressure was controlled is given for each quintile of antihypertensive drug days per year in Figure 2. In the lowest quintile (fewer than 90 drug days), the control rate was only 12%; in the two highest quintiles (270–399 drug days and ≥ 400 drug days), the control rate was nearly 33%. The positive association between drug days and blood pressure control was significant ($P = .017$) by a chi-square test for trend. An apparent leveling off in the highest quartiles suggests that there may have been a threshold number of drug days per year beyond which the rate of control was not increased.

Of the 201 employees treated for their high blood pressure, 95 (47%) received more than one type of antihypertensive medication, and 156 (78%) received at least one of the newer-generation medications (ACE inhibitors, calcium channel blockers, and alpha blockers). Although the controlled group did appear to have received a larger number of drug types than the uncontrolled group (mean [SD] = 1.82 [0.89] vs 1.57 [0.76], $P = .059$; median = 2 vs 1; see Table 2), no single type of medication, either alone or in combination, produced a significantly improved rate of control. Still, the 84 employees whose drug regimen included a diuretic did have significantly more drug days than those whose regimen did not include a diuretic (mean [SD] = 339 [269] vs 234 [163], $P < .001$; median = 300 vs 210). Not surprisingly, these employees were marginally more likely to achieve control (odds ratio = 1.84, 95% confidence interval = 0.96, 3.50).

In contrast, a larger number of physician visits per year was neither associated with control nor correlated with the number of antihypertensive drug days ($r = .119$, not significant).

Multivariate Analysis

In a logistic regression model (Table 3) testing for the independent effect of each variable on awareness, only older, more obese, and Black (vs White) employees were significantly more aware of their high blood pressure. Moreover, in a similar regression model with treatment as the outcome variable, only older and more obese employees and those with more physician visits were significantly more likely to be treated for their high blood pressure. Thus sex, education, and, for the most part, race were not indepen-

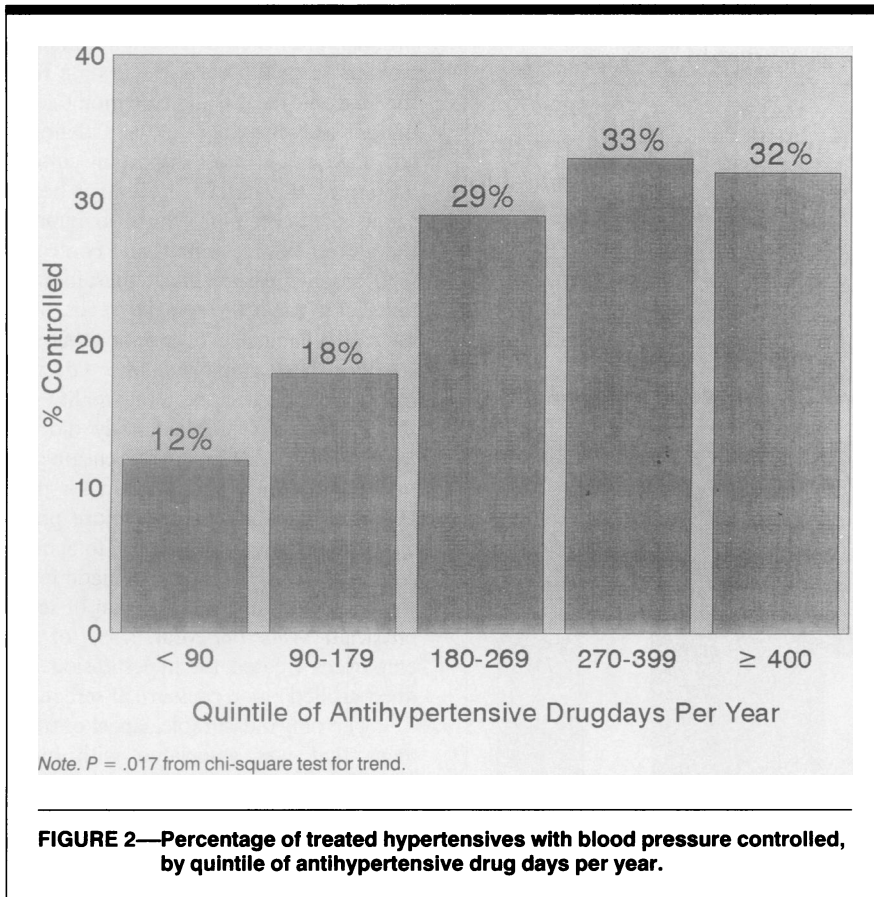


FIGURE 2—Percentage of treated hypertensives with blood pressure controlled, by quintile of antihypertensive drug days per year.

TABLE 3—Logistic Regression: Hypertension Awareness, Treatment, and Control

	Odds Ratio	95% Confidence Interval
Awareness		
Female sex (vs male)	1.49	0.88, 2.50
Age ^a	1.57	1.22, 2.02
Black race (vs White) ^b	2.72	1.49, 4.96
Hispanic race (vs White)	1.88	0.89, 3.98
Body mass index ^a	1.28	1.03, 1.58
Education > 12 y (vs ≤ 12 y)	0.68	0.40, 1.13
Number of physician visits ^a	1.08	0.97, 1.22
Treatment		
Female sex (vs male)	1.66	0.88, 3.13
Age ^a	1.80	1.27, 2.56
Black race (vs Hispanic) ^b	1.62	0.73, 3.60
White race (vs Hispanic)	0.86	0.33, 2.20
Body mass index ^a	1.43	1.09, 1.87
Education > 12 y (vs ≤ 12 y)	0.69	0.37, 1.29
Number of physician visits ^a	1.29	1.09, 1.53
Control		
Female sex (vs male)	4.12	1.51, 11.29
Age ^a	1.01	0.63, 1.63
Black race (vs Hispanic) ^b	1.80	0.45, 7.15
White race (vs Hispanic)	1.58	0.33, 7.55
Body mass index ^a	0.99	0.75, 1.31
Education > 12 y (vs ≤ 12 y)	0.51	0.23, 1.13
Number of physician visits ^a	1.02	0.84, 1.22
Number of antihypertensive drug days ^a	1.22	1.00, 1.49

^aFor the continuous variables, odds ratios per unit increase in (1) age = 10 years, (2) body mass index = 4 kg/m², (3) number of physician visits = 4 per year, (4) number of antihypertensive drug days = 100 per year.

^bFor race, White is the referent group for awareness and Hispanic is the referent group for treatment and control.

dently associated with a failure to be aware or to enter treatment. Finally, in a regression model with control as the outcome variable, only sex and the number of antihypertensive drug days were independently associated with blood pressure control.

The blood pressure outcomes reported here depend on the currently recommended level of 140/90 mm Hg or higher as the marker for hypertension. If a level of 160/95 mm Hg or higher is used, the distributions of blood pressure outcomes change but the trends persist. At this higher level, only 286 employees met the criteria for hypertension; 248 (87%) were aware, 201 (70%) had been treated, and 115 (40%) had controlled their blood pressure.

Race/Ethnicity

Hispanics had a relatively high rate of hypertension awareness but low rates of treatment and control and significantly fewer antihypertensive drug days, particularly in comparison with Whites (Table 4). We calculated awareness, treatment, and control ratios for each racial/ethnic group (Figure 3). For example, in the controlled group, 25.5% were White, and in the uncontrolled group, 20.0% were White, resulting in a "control ratio" of 1.28 for

Whites. (A ratio greater than the reference level of 1.00 means that the racial/ethnic group was overrepresented in that outcome group [e.g., the control group was disproportionately White].) In contrast, the control ratio for Hispanics was only 0.35. These ratios allowed a standardized scale for comparison not only within but between the outcome categories. Not all of the differences between racial/ethnic groups at each level of awareness, treatment, and control are statistically significant, but together they suggest that different racial/ethnic groups appear to be vulnerable at different points along the path to blood pressure control. For example, Hispanics were less likely to be in treatment or to have their blood pressure controlled, whereas Whites were less likely to be aware of their high blood pressure but more likely, once in treatment, to achieve control.

Discussion

Our principal finding is that more than 80% of these insured health care workers failed to achieve blood pressure control despite full access to and active participation in the community's medical care system.

Different groups stumbled at different points along the path to hypertension control. Some were unaware, others were aware but not treated, and the blood pressure of a disappointingly large fraction remained uncontrolled despite treatment. As might have been expected, since

TABLE 4—Number of Antihypertensive Drug Days per Year, by Race

	n	Mean	SD	Median	<i>P</i> ^a
White	39	331	221	300	.064 .020 .002
Black	115	265	208	224	
Hispanic	28	183	180	125	

^aFrom Mann-Whitney test between means. White vs Black, *P* = .064; Black vs Hispanic, *P* = .020; White vs Hispanic, *P* = .002.

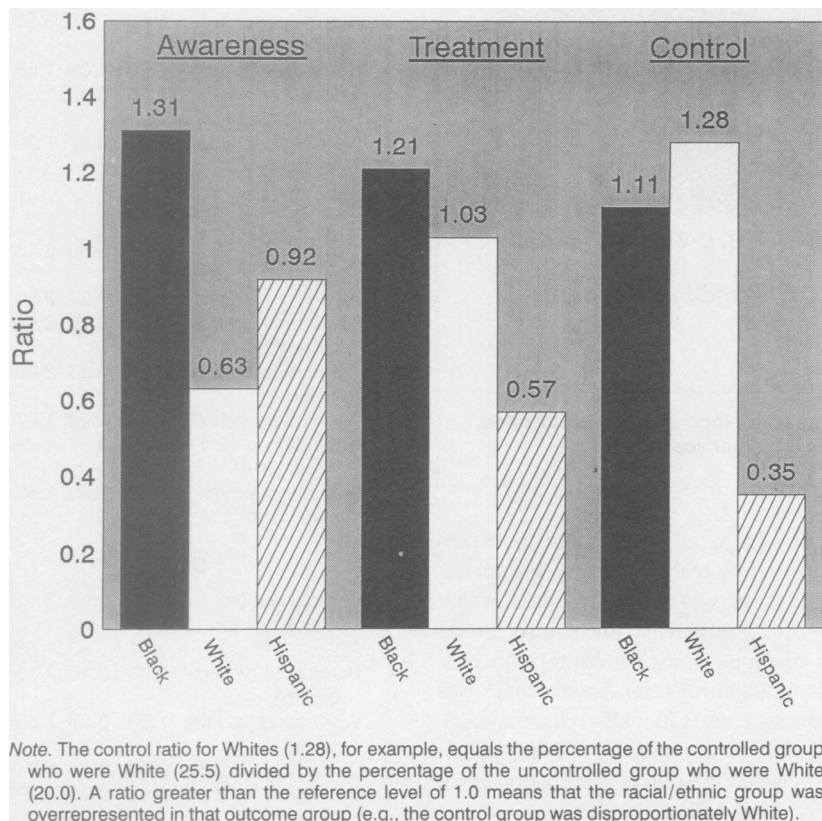


FIGURE 3—Hypertension awareness, treatment, and control ratios, by racial/ethnic group.

they are known to have higher blood pressure, older and more obese people were more likely to be aware and to be treated. Once in treatment, however, they were no more likely to have their blood pressure controlled. In contrast, women were no more likely than men to be aware of or treated for their hypertension, but once in treatment, as predicted by national data,¹² they were far more likely to achieve control.

Other patient characteristics—race, for example—also influenced outcomes at each step to blood pressure control. Hispanics were more likely than non-

Hispanic Whites to be aware of their high blood pressure, but they were less likely to be treated or to achieve control and they had significantly fewer days of antihypertensive medication. Other studies have found similar relatively poor rates of hypertension control, as well as less frequent use of medical services, in Hispanics compared with non-Hispanic Whites.^{13–17} In the United States, Hispanics constitute a heterogeneous, culturally diverse, and rapidly growing minority population. A cultural gulf may keep Hispanics, in particular, from effectively using the health care system even when

they are aware that they have a health problem and when there are no financial barriers to health care. Using data from the Hispanic Health and Nutrition Examination Survey, Solis et al. identified language as the most important cultural barrier to the use of preventive health services.¹⁸ Successful efforts to improve the awareness, treatment, and control of high blood pressure must, therefore, be tailored to meet the specific needs, as in the case of language, of specific groups.

For those employees who did enter treatment, the disappointing reality was that physician visits frequently did not translate into adequate hypertension control. Of the employees treated for their hypertension, those making more physician visits were no more likely to achieve control than were those who made fewer visits. Indeed, despite a median of seven physician visits per year, 75% of the employees treated for hypertension had uncontrolled blood pressure at screening.

The only measurable aspect of treatment that was associated with blood pressure control was the amount of antihypertensive medication obtained. More days of medication meant better control. There was, however, no correlation between physician visits and antihypertensive drug days. The patients who saw their doctors most often did not receive more medication. Thus, although the patients in this study visited their physicians nearly twice as often as the average New Yorker,¹⁹ one goal of these visits was usually not achieved.

A gap between the potential to control blood pressure and the achievement of control was recognized soon after effective hypotensive agents became readily available.⁵ Since then, a consistent pattern characterized by high rates of attrition and failed therapy has been widely documented. For example, during the 1970s in the private practice of an internist in an affluent section of Manhattan, 51% of a sample of hypertensive patients with at least two physician visits were lost to follow-up 1 year after their initial visit.⁶ Furthermore, of those still in treatment at 1 year, only 55% had controlled blood pressure by the contemporary standards. At the same time, a study of antihypertensive treatment in the general medical clinic of a New York City university hospital produced similar results: half of the hypertensive patients were lost to follow-up 1 year after their initial visit, and only one third achieved control of their hypertension.⁷ In the inner cities, where patients face the

additional problems of poverty, illiteracy, substance abuse, and homelessness, outcomes are often even worse.^{20,21} Thus, over time and in a variety of settings, it has been common for as many as half of the patients treated for hypertension to drop out within a year of their initial physician visit and for no more than 50% to 60% of those remaining in treatment to achieve blood pressure control.²²⁻²⁵

Vigorous public efforts led by the National High Blood Pressure Education Program and embraced by physicians' groups and the pharmaceutical industry have steadily improved blood pressure outcomes in the past 20 years.² To this point, however, overall increases in control have largely been driven by increases in awareness and entry into treatment among people with hypertension. Despite great technical advances, specifically the development of a wide range of new antihypertensive drugs and drug classes, the process of care available in the community has not changed to any great extent, and treatment itself remains highly inefficient.

The striking point here is that even under the conditions enjoyed by these workers, only one quarter of those actively treated for hypertension achieved control over their blood pressure at the recommended level of less than 140/90 mm Hg, and only slightly more than half of those treated achieved control at the less desirable level of less than 160/95 mm Hg. These results are virtually identical to those reported for Chicago workers more than 2 decades ago,⁵ and they suggest that, as rates of awareness and treatment reach their limits, overall control cannot be expected to improve significantly.

The strength of this study is that it is based on the real-world experience of a diverse population of health care workers who actively used the health care system. There was essentially complete capture of health care utilization and expenditures data. In addition, the disparities in socioeconomic status, education level, and access to health care that are often blamed for poor health outcomes were either muted or eliminated in this study group.

There are, nevertheless, limitations to this study. They include (1) the measurement of blood pressure at only one encounter; (2) lack of knowledge about the specific content of the physician visits or the histories of patient treatment prior to the year under study; (3) incomplete knowledge of treatment patterns, in particular the inability to identify patients

who initiated, stepped down from, or dropped out of treatment in the year under study; (4) reliance on pharmacy records as a surrogate for actual pill consumption; (5) the potential hazards of using administrative databases for epidemiological studies²⁶; and (6) the small numbers of subjects in certain categories of the analysis.

As an asymptomatic, chronic illness, hypertension does not pose a problem of diagnosis or cure, but rather the challenge of daily vigilance and ongoing commitment to treatment. Of the many reasons that treatment fails, including drug side effects and cost, the most commonly cited focus on the relationship between the patient and the physician.^{27,28} For most people with high blood pressure, periodic visits to the physician's office simply do not produce the desired outcome.

Still, disappointing therapeutic results are not inevitable. Categorical treatment programs designed for specific, chronic conditions have achieved greater success than traditional office-based treatment. Successful programs in a wide variety of settings and according to a wide variety of designs systematically direct efforts toward achieving long-term adherence to therapy.²⁹⁻³² For example, several such programs based at work sites have achieved at least 95% participation rates and control rates of 50% to 60% at the 140/90 mm Hg cutoff and more than 80% at the 160/95 mm Hg cutoff 1 year after entry.³³⁻³⁵ These programs typically rely on multidisciplinary teams working according to a well-defined stepped-care protocol. They are characterized by ready access at low or no cost to the patient, systematic monitoring to minimize the number of patients lost to follow-up, ongoing patient education, and a supportive community.³⁶

Our data suggest that the medical care system, as it presently exists, is poorly suited to meet the needs of the vast majority of hypertensive patients it serves. Even in a group that enjoyed full access to conventional care and widespread use of the newer antihypertensive drugs, outcomes were just as disappointing as those observed 2 decades ago. Increased access, by itself, is not likely to break this pattern of failure. If significant improvement in hypertension control is to be achieved, either the primary care process must be improved or a superior approach must be instituted. □

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