
Hypertension Followup in an Urban Black Population

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SINCE PUBLICATION of the Veterans Administration Cooperative Studies (1,2), there have been intensified efforts to identify people with asymptomatic, mild-to-moderate hypertension and to offer them drug therapy. Antihypertensive treatment is beneficial in preventing cardiovascular complications in those with diastolic blood pressure of 105 through 114 mm Hg, although the benefits of treatment in those with milder hypertension remain uncertain. In this milder hypertension group, treatment may not prevent morbidity; age and cardiovascular status may be more important in evoking morbidity (3). Current recommendations of the Joint National Committee on High Blood Pressure are that treatment be individualized for those with diastolic readings consistently

in the 95–104 mm Hg range (4).

Hypertension is more prevalent in the black than the white populations (5) and more likely to cause morbidity and mortality in blacks (6). Adequate therapy for hypertension demands continued compliance with a drug regimen over long periods despite a lack of symptoms. However, the hospital clinics and emergency rooms that urban blacks frequently use for health care do not foster such long-term compliance because care is frequently impersonal, fractionated according to specialty service, and characterized by a high rate of broken appointments.

Neighborhood health centers, in contrast, were designed to provide accessible, continued, and personalized care; therefore, they should be a better setting than the hospital clinic for the control of cases of hypertension. Despite current interest in hypertension, there are few reports in the literature of the outcomes of long-term therapy of patients treated in primary care settings and only a single study of

continued followup of urban blacks (7).

Theiss Health Center is located in a housing project of 4,300 residents, about one-half mile from the University Health Center of Pittsburgh. It is part of the University Health Center complex, administered through the School of Medicine's Department of Community Medicine, and its staff provides medical and dental services at no charge to residents. The housing project residents are 95 percent black. The physicians and nurse practitioners on duty at the center 5 days a week have offered primary care and health maintenance services to all age groups since 1970. This report describes the followup of 215 black adults with hypertension identified over a 5-year period at Theiss Health Center; 183 of them were followed for 1 year or longer.

Methods

Complete health assessment at Theiss center included a history and physical examination in addition to various screening tests appropriate

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to the person's age and sex. This program has been described in a 1975 report (8). Residents were eligible for continuing primary care at the center if they lived in the Terrace Village II housing project, and they were encouraged to return annually for repeat physical examinations. Because residence in the project could be determined from records of the housing authority rental office, it was possible to identify patients who had moved away or died. Over the period from 1971 through 1975, the project's mean population was approximately 4,300, of whom 2,900 (67 percent) were 16 years or older. The annual turnover was about 10 percent of the project's population.

Hypertension was diagnosed for 267 of the 1,350 people who had health assessments in the 5-year period. The following information was abstracted from the charts of 262 persons (98 percent of the group): age, sex, marital status, primary source of income, data of diagnosis, date of last visit, total number of clinic visits, initial and final mean diastolic blood pressure readings, history of hypertension, treatment status, care status, cardiovascular risk factors, and the presence of certain complications.

A person was assigned to the "confirmed hypertensive" group if he or she (a) visited the center three or more times and (b) his or her blood pressure (BP) reading

averaged 90 mm Hg or more for three consecutive visits. This diastolic BP criterion differs from the Public Health Service criterion that each of 3 BP readings exceed 90 mm Hg. If the Public Health Service's definition of hypertension had been used, only five persons would have been eliminated from the confirmed hypertensive group, and the subsequent course of their conditions justifies including them in this study. Of the 262 clinically diagnosed as hypertensive, 215 persons, or 82 percent, met criteria (a) and (b).

Results

Approximately 16 percent (34) of those with confirmed hypertension were male and 84 percent (181) were female; essentially the same proportion of men and women prevailed among the 1,350 people who had come for health assessment to the Theiss center. Public welfare was the primary source of income for 49 percent of the hypertensives, 29 percent received Social Security assistance, and 16 percent were employed. The mean age of those in the group was 55.8 ± 14.3 years. At the time of first appraisal, 56 percent of the patients had a history of elevated blood pressure, and 63 percent of these were already taking medication.

In the evaluation of the 95 persons with confirmed new cases, 98 percent had a complete history,

physical examination, urinalysis, blood count, and analysis of urea nitrogen, creatinine, electrolytes, blood sugar, cholesterol, and uric acid. Chest X-rays and electrocardiograms were performed for 89 percent. Sixteen percent of the new patients also had an intravenous pyelogram or other specific examinations (24 hour urine for vanillyl-mandelic acid; angiography, and so forth) as part of their evaluation.

Three types of outcome measures were employed to judge the effectiveness of the Theiss center program for hypertensives: (a) compliance, in terms of continuation in the clinic program as defined subsequently; (b) lower blood pressure, preferably in the normal range; and (c) development of complications of hypertension.

In the evaluation of the center's followup, the 183 hypertensives first seen at least a year or more before the close of the study in December 1975 were considered. Of these, 98, or 54 percent, were considered currently complying with a medical regimen for hypertension. Another 57 (31 percent) were considered inactive because (a) they had not come for a refill of medication or blood pressure check in 6 months or more or (b) they had attended the clinic less than twice per year during the entire period of follow-up. Twenty persons had moved out of the housing project, and 8 had died. Thus, if only those alive and

Table 1. Cohorts of patients by length of observation and status in Theiss Health Center's hypertension program

Length of observation	Total number	In compliance			Inactive		Left project or died	
		Number	Percent of total	Percent of eligibles	Number	Percent	Number	Percent
12-23 months	39	14	36	45	17	44	8	20
24-35 months	43	20	46	62	12	28	11	26
36-47 months	48	27	56	68	13	27	8	17
48 or more months	53	37	70	71	15	28	1	2
Totals	183	98	54	67	57	31	28	20

eligible for care are considered, 63 percent of the patients (98 of 155) were still active in the program. Table 1 illustrates various cohorts by length of followup. Generally, more of those seen earlier in the program's existence tended to re-

main active. Most dropouts in each cohort occurred during the first year of observation.

Overall, the mean number of health center visits per person per year of observation for the entire group of 215 was about 8; these

included all visits for primary care. The mean period of followup for these patients was about 34 months.

Outcomes of antihypertension therapy for the whole group are shown in more detail in table 2. The initial reading represents the mean diastolic BP for the first three visits and includes values with the patient sitting, lying, and standing during each visit. The BP level after treatment represents a mean diastolic BP with the patient in various positions at the last visit for management before the conclusion of the study. Overall, 37 percent of the patients had BPs in the normal range at their last followup visit, and an additional 21 percent had improved—that is, their BP dropped to a lower range, but not to normal. Among the 80 persons with initial diastolic BPs of 105 mm Hg or greater, the readings of 22 percent were normal and an additional 56 percent were improved.

Table 3 combines data on various cohorts of patients who continued under surveillance with information on achievement of normal blood pressure levels. The ideal outcome is assumed to be a normal pressure as well as continuing under surveillance, but only 21 percent of the patients fulfilled both these conditions. Although the numbers were not significantly different, those

Table 2. Patients' blood pressures (BP) after treatment for hypertension, by initial BP class

Initial BP class	Total		BP level after treatment			
	Number	Percent	Normal	Improved	Unchanged	Worse
90-104	135	63	62	..	64	9
105-114	54	25	15	26	10	3
115-124	19	9	3	14	1	1
125 and over	7	3	0	5	2	..
Total	215	100	80	45	77	13

Table 3. Patients achieving normal blood pressure (BP) levels by end of study period, according to interval since initial evaluation at Theiss Health Center and surveillance status

Interval since initial evaluation	Total number	Normal BP		Normal BP and still active ¹	
		Number	Percent	Number	Percent
12-23 months	39	13	33	5	13
24-35 months	43	16	37	8	17
36-47 months	48	19	40	11	23
48 or more months	53	22	42	14	26
Total	183	70	38	38	21

¹ Seen at the center for BP check or medication refill in previous 6 months, and had been seen no less than twice per year of follow up.

Table 4. Complications of hypertension noted at initial evaluation and during followup among 213 patients with adequate followup information

Complication	Complications already present			New complications		
	Initial hypertensive class			Initial hypertensive class		
	Mild (N = 134)	Moderate or severe (N = 79)	Percent with complication	Mild (N = 134)	Moderate or severe (N = 79)	Percent developing complication ¹
Coronary heart disease ² ..	19	17	17	5	2	3.3
Cardiomegaly ³	34	21	26	7	2	4.2
Renal disease ⁴	9	10	9	5	4	4.2
Stroke ⁵	4	1	4	2	5	3.3

¹ Mean followup 33.7 ± 18.0 months.

² History of infarct or angina, or definite ECG evidence of ischemic heart disease.

³ Definite criteria for left ventricular hypertrophy of ECG or cardiomegaly on chest X-ray.

⁴ Elevated blood urea nitrogen or creatinine or both, with no specific cause identified other than hypertension.

⁵ Definite history of stroke, or clear neurologic signs or sequelae.

who had received an initial assessment earlier—that is 36 or more months before December 1975, the cutoff point for collection of data—tended to have more satisfactory outcomes. However, there was no real difference in achieving a reduction in blood pressure levels between the 98 persons currently under supervision and the 57 classified as inactive. For example, at their last clinic visit 39 percent of those under supervision had normal BPs, as did 37 percent of the 57 inactive patients. In all the followup cohorts, a history of hypertension before being evaluated at Theiss center appeared to be unrelated to outcome, either in terms of the final blood pressure level recorded or continued compliance with a prescribed regimen.

The occurrence of various complications of hypertension listed in table 4 was recorded for the center's patients: (a) development of clinical coronary artery disease, (b) development of cardiomegaly revealed by chest X-ray or ECG or both, (c) evidence of new renal involvement, and (d) stroke. Thirty-two events that occurred since their initial evaluation were experienced by 29 people. In this relatively small group, no difference in occurrence of complications could be observed by initial severity of hypertension or by BP status at last visit. Table 4 shows already present and newly developed complications by initial BP status, but the results when analyzed by final BP control are similar.

However, only 1 woman of the 70 with a normal BP at the end of the study, who had been observed for at least 1 year, developed cardiomegaly during followup, while 8 of the 113 with BPs still elevated showed new evidence of cardiomegaly ($X^2 = 2.95, P < 0.10$). This difference is not statistically significant, but it suggests a bene-

ficial effect of treatment, since both groups initially had a 21 percent prevalence of cardiomegaly, implying similar severity of cardiac involvement.

Three of the 34 men and 75 of the 181 women (41 percent) in the study were clinically diagnosed as obese on their medical charts. The diagnosis of obesity appeared to be highly specific because, in a subgroup of every fourth obese patient, 89 percent (17 of 19) weighed more than 20 percent above ideal weight for height as calculated from life insurance charts (9). Outcome parameters were examined in terms of obesity status, but only for the women since there were so few obese men.

Obese patients had a mean age of 51.8 ± 14.3 years, compared with 58.1 ± 15.3 years for the nonobese. Thirty-four of the 75 obese women (45 percent) initially had diastolic BPs of less than 105 mm Hg, while 80 of 106 nonobese women (75 percent) had BPs in this low range. Obese women were significantly less likely to have mild hypertension ($X^2 = 17.44, P < 0.01$). The two groups were similar, however, in terms of complications evident on initial examination (table 5). There appeared to be an excess of patients with cardiomegaly in the obese group (32 percent and 22 percent), but this statistic was not significant. The two groups were very different,

however, in new complications noted during the followup period. Twenty-seven percent of the obese women developed coronary artery disease, cardiomegaly, renal involvement, or stroke, while only 8 percent of the nonobese women did so. This difference is highly significant ($X^2 = 10.60, P < 0.01$).

At the last recording, 69 percent of the obese women had elevated BPs compared with 42 percent of the nonobese women. Despite weight reduction programs, only 13, or 17 percent, of the obese group lost 20 or more pounds during followup, and those who did so appeared to fare more poorly than those who did not lose weight. Seven new complications occurred in 6 people who lost weight, while 14 events in 14 patients occurred in the group who maintained weight ($X^2 = 3.05, P < 0.10$). These statistics suggest that weight reduction was often occasioned by an event such as myocardial infarction, rather than as a result of prophylactic dieting.

Discussion

Hypertension is highly prevalent in the adult population, particularly among black people (5). In a major screening program at about 1,100 sites, more than 45 percent of blacks aged 40–49 and more than 50 percent of those in the 50–64 year age group had diastolic pressure of more than 90 mm Hg (10). In an-

Table 5. Complications noted at initial evaluation and during followup in hypertensive women, by obesity status

Complication	Initial evaluation		New complications	
	Obese (N = 75)	Nonobese (N = 106)	Obese (N = 75)	Nonobese (N = 106)
Coronary heart disease	12	20	6	2
Cardiomegaly	24	23	5	3
Renal disease	3	10	5	3
Stroke	0	2	4	1
Total complications	39	55	20	9

other study, 37 percent of black adults were hypertensive on first screening (11). Many of these screenees, of course, do not have sustained hypertension when they are evaluated. However, nearly 50 percent of those who fail on a casual screening BP may ultimately be found to be hypertensive (12). Although the black population is at high risk, there is little information in the literature regarding outcomes of treatment for black hypertensives. This report demonstrates modest success both in continuing patients in treatment and in reducing the BPs of those in compliance with a medical regimen. The patients were residents of a low-income black, urban community. Sixteen percent of the 1,350 adults who came for evaluation at the neighborhood's primary care center were hypertensive. The majority (56 percent) had been previously diagnosed, and 84 percent were women.

The center's staff evaluated compliance, blood pressure measurements, and occurrence of complications. Sixty-seven percent of those still eligible for care who had been followed for more than 1 year remained active at the end of the study period. Those who dropped out of followup did so generally in the first year of observation. Overall, 37 percent of the patients had normal BPs at the end of the study period, and this percentage was about the same for those followed 1, 2, 3, or 4 years. About one-fifth of the hypertensives had normal BPs and at the end of the study period were still being followed.

The few patients who experienced complications during the study period did not differ significantly from others as to whether their blood pressure was controlled. However, obese women tended to have higher readings, to show less improvement with treatment, and to have more frequent complica-

tions during followup, although the mean age of obese patients was 6 years less than the nonobese.

What results can be expected in a cohort of patients treated for hypertension in an ambulatory care setting? Most published reports deal with hypertension screening programs, which often have high dropout rates and, consequently, follow-up evaluations are difficult to interpret. In one industrial screening program, 806 people were originally found to be hypertensive, but final BPs were available only for 44 percent of the group after 2 years, and 60 percent of these persons had normal readings (13). In another program, 90 of 116 (78 percent) identified hypertensives were seen after 2 years, and 82 percent then had normal BPs (14). A third group identified at a shopping center screening program in Canada included 624 initial screening failures; 99 of 152 people contacted after 18 months (65 percent) who were supposed to be on antihypertensive medication actually had normal BPs (15). But what of all the others? Many, of course, did not have sustained hypertension. But in all such reports of screening programs, it is difficult to distinguish those who were not hypertensive in the first place, those who simply failed to see a physician, and those who started treatment but later dropped out.

Lo Gerfo reported on a program in Seattle (7) similar to the one at the Theiss center. The prepaid health care project in Seattle included 147 patients diagnosed as hypertensive who were medically indigent rather than being on Medicare or receiving welfare payments. Eighty percent of the group were black. The diagnosis was confirmed on the medical charts of only 101 of the 147 persons. Of the group, 66 percent had BPs of 95 Hg or lower at last visit. This group is not en-

tirely comparable in that a diastolic reading below 90 was termed "normal" BP for the Theiss center's patients.

Both compliance with medical regimen and outcome of treatment in this series of black hypertensives suggest that the present treatment and followup is unsatisfactory, although there are few data in the literature for comparison. Are all hypertensive patients with a given pressure at equal risk of target organ involvement, or are some subgroups especially prone to complications? In this group, most patients (63 percent) had initial diastolic pressures below 105 mm Hg, and perhaps drug therapy should not be required for these people. On the other hand, there was no significant difference in new complications between those who initially had mild hypertension (20 events in 135 people) and those who had diastolic pressure readings of 105 mm Hg or more (14 events in 79 people), or between those with normal final pressures (11 events in 77 people) and those whose BP remained elevated (24 in 134 people).

The obese patients fared worse than the nonobese. Nearly 60 percent of the nonobese patients had normal BPs at the end of the study, while only 30 percent of the obese achieved normotension. This outcome suggests one of the following hypotheses: (a) obese patients are less compliant with treatment, (b) hypertension is more resistant to drug treatment in obese people, particularly obese black women, or (c) the initial and final BPs are both falsely high because of large arm circumference.

Pickering contends that BP must be corrected for arm circumference and provides a table of correction factors (16). This approach has not generally been accepted in the United States. It is unlikely that

pressures were disproportionately high because of larger arm circumference since the obese women did indeed have more complications of hypertension than the nonobese.

Alternative (b) could be true if, for example, larger doses of common antihypertensive drugs were required to provide similar effective tissue levels of medication in the obese patient. If physicians tended to prescribe the same doses for people of different sizes and used the same dosage limits before switching from initial to stronger drugs, perhaps obese patients would more often have a less than effective dose. Another possibility is that the salt intake of obese people may well be higher than that of normal weight persons, corresponding to a higher calorie intake. This greater salt load may result in more resistance to the drugs used in treatment. However, Reisin and co-workers have recently found highly significant blood pressure decreases in overweight hypertensives by weight loss alone, without salt restriction (17). In any case, the obese black women in the present series appeared particularly susceptible to hypertensive complications.

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SYNOPSIS

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In a 5-year period, 215 black hypertensives were identified at a neighborhood primary care center that offered free services to residents of a low-income housing project. The mean length of followup for the group was about 34 months, and 183 persons were followed for more than 1 year. Their mean age was 56 years;

there were 34 men and 181 women in the group. Fifty-six percent of the 215 persons had a history of hypertension when they came to the center.

Three types of outcome measures were examined in this study: (a) compliance, in terms of continued activity in the clinic; (b) lower blood pressure, preferably in the normal range; and (c) development of complications of hypertension. Sixty-seven percent of those alive and still residing in the area were continuing in the program; 37 percent achieved

normotension and an added 21 percent had improved blood pressure readings. There was no statistical difference in the occurrence of hypertensive complications by initial severity of the hypertension or by how well the blood pressure was controlled.

The 75 obese women in the group had more severe hypertension, more new complications, and were less likely to achieve normotension than the 106 nonobese women. These relationships were statistically significant.