A Clinic and Community-Based Approach to Hypertension Control for an Underserved Minority Population: Design and Methods

H.J. Ward, D.E. Morisky, N.B. Lees, and R. Fong

This paper describes the design and methodology of the Community Hypertension Intervention Project (CHIP). CHIP is investigating the environmental and psychosocial factors related to treatment adherence and examining the effects of combining usual hypertension care with the effects of three interventions designed to improve patient compliance with treatment for high blood pressure in a high-risk, underserved minority population. Thirteen hundred and sixty-seven inner-city hypertension patients (75% black and 25% Hispanic) have agreed to participate in the 4-year longitudinal study. These participants were randomized to usual care or one of three intervention groups: individualized counseling sessions; home visits/discussion groups; or computerized appointment-tracking system. Participants are representative of the surrounding, predominantly low-income minority community and are treated in a hospital-based clinic and in a private clinic in the community. About 65% have blood pressure levels considered to be out of control. It was concluded that structural changes at the clinic site, along with the targeted interventions, would improve patient satisfaction, increase treatment adherence, and improve blood pressure control. Am J Hypertens 2000;13:177–183 © 2000 American Journal of Hypertension, Ltd.

KEY WORDS: Randomized clinical trial, community-based interventions, underserved minorities.

Hypertension affects about one in four Americans and is a primary antecedent to several diseases that are leading causes of death in the US, including stroke, heart failure, arteriosclerosis, and end-stage renal disease. However, although public awareness of the issues of high blood pressure has improved over the past 25 years, there is evidence that hypertension continues to contribute significantly to mortality and morbidity in adults, eg, age-adjusted stroke rates have increased slightly since 1993, the rate of decline in coronary heart disease is leveling, and the prevalence of heart failure and end-stage renal disease is increasing.2

This paper describes the background and design of, and participants in, a combined clinical and community-based hypertension intervention program focused on high-risk, underserved inner-city minority populations. The 4-year randomized clinical study is investigating the efficacy of instituting environmental changes at the clinic, eg, eliminating block appointment scheduling and individualizing appointment times to improve patient care and increase satisfaction with care. Three interventions (computerized patient tracking/reminders, home visits/discussion groups,
and short counseling sessions after clinic visits) designed to improve treatment adherence are being compared with the usual care provided by the clinic.

**Background** Hypertension has been, and continues to be, a significant health problem among minority populations. Blacks and individuals of lower socioeconomic status (SES) are overrepresented among those at risk from high blood pressure in the United States. Morbidity and mortality rates for cardiovascular disease, coronary heart disease, stroke, kidney disease, and diabetes mellitus are higher for black men and women than for their white counterparts. These difficulties may result in reduced levels of treatment adherence. Moreover, the prevalence of hypertension has decreased in every age/gender/race subgroup during the past 20 years, except for black men aged greater than 50 years.1

Furthermore, although Hispanic adults have a slightly lower prevalence of high blood pressure than the population at large, Hispanics demonstrate higher levels of some risk factors for high blood pressure, such as obesity and lower levels of physical activity, as well as higher rates of diabetes mellitus (for which hypertension is often antecedent) than do non-Hispanic whites.9,10 Hispanics with high blood pressure are less likely to be receiving treatment for hypertension than others in the United States (about 35%, compared with 53%), and fewer Hispanics in treatment have their blood pressure under control (14%, compared with 25% of blacks and white Americans).1

Furthermore, the accumulation of risk factors, eg, engaging in increased multiple-risk behaviors such as alcohol use, smoking, and eating high-fat diets, living in higher-stress environments, and having reduced access to early detection and treatment, results in a higher prevalence of hypertension among individuals of lower SES.2,11 Thus, certain minority groups, such as blacks and Hispanics, are at greater risk of hypertension and its health consequences, and this risk is exacerbated by low socioeconomic status (eg, references 5,11). Programs developed to reduce the incidence of, and mitigate the negative effects of, high blood pressure must focus additional effort on the amelioration of hypertension among these groups at highest risk.

**Adherence to Treatment for Hypertension** Treatment for hypertension often includes one or both of two components: lifestyle modifications and pharmacologic treatment. Lifestyle modifications are often quite difficult to achieve and maintain, and medication regimens are sometimes complex, difficult to remember, or may have adverse side effects. These difficulties may result in reduced levels of treatment compliance and poorer blood pressure control.12–15 For example, during the first year of treatment 16% to 50% of patients discontinue their medication13 and, over time, only about 30% to 50% of patients adhere to their hypertension medication regimens.13,16 Moreover, the number of patients who adhere to hypertension treatment is even smaller if suggested lifestyle modifications are included in the calculation. Only about 25% to 50% of patients in treatment for hypertension have blood pressure levels considered to be under control (<140 mm Hg systolic and <90 mm Hg diastolic).1,17 and much of this is due to low levels of treatment adherence.

Adherence to treatment for high blood pressure is influenced by a number of factors, including internal locus of control over health and blood pressure, social support, knowledge about the treatment regimen, better physician-patient communication, the patient’s belief in the utility of the treatment, the complexity and difficulty of the regimen, coping style, and the patient’s level of distress about the illness, among others.12–20 Moreover, cultural variation in health and illness beliefs and behaviors, such as a present versus a future orientation toward hypertension and its causes, affects patients’ adherence to prescribed medical treatment.21 Thus, the antecedents to adherence to hypertension treatment are multiple and complex. As a result of the multifaceted nature of treatment adherence, improving patient compliance with recommended treatment for hypertension is difficult.

**Intervening to Improve Adherence** Single intervention strategies such as the use of appointment reminder systems, counseling sessions, or small group discussions, have been found to improve compliance with hypertension treatment. For example, interventions emphasizing and encouraging family support, increasing patient-provider interactions, and providing small group discussions about adherence issues positively influenced blood pressure control.22–24 In particular, educational and health promotion programs tailored to the educational and cultural characteristics of the targeted participants successfully reduced hypertension25 and improved lifestyle factors such as quitting smoking and reducing fat intake26,27 in minority, low-income, or low-education individuals at risk for hypertension and related disorders. Postcard appointment reminders and computerized patient monitoring systems28 have been further found to improve the appointment keeping of hypertensive patients. Thus, single interventions such as reminder systems, individual counseling, and discussion groups may improve patient adherence to appointments, treatment, and medication regimens for hypertension. However, the relative efficacy of these different interventions has not been examined. Furthermore, a recent adherence meta-analysis indicated that comprehensive interventions combining multiple biobehavioral and cognitive components may be more effective than single-focus interventions.29 This sug-
suggests a need for further examination of what type of single intervention most successfully enhances treatment adherence and improves outcomes for high-risk, underserved minority hypertension patients.

The Community Hypertension Intervention Project (CHIP) CHIP is a 4-year longitudinal program designed to develop effective strategies for enhancing treatment adherence for hypertensive minority populations. CHIP was developed at a medical center in a large West Coast city that primarily serves low-income, inner-city, black and Hispanic residents (about 45% blacks and 55% Hispanic). Adult participants were recruited from newly and previously diagnosed outpatients attending hypertension, nephrology, and family practice clinics at the medical center or a private health maintenance organization (clinic HMO) in the same community. Thus, CHIP targets a population segment at highest risk for morbidity and mortality due to hypertension: low-income inner-city black and Hispanic adults. In addition, all CHIP participants received standard medical care for hypertension, including medications, dietary counseling, and nonpharmacologic interventions (eg, smoking cessation, weight reduction, and salt restriction). CHIP participants took part in one of three intervention conditions or a usual care condition. The three interventions were designed to increase self-improvement skills, leading to greater self-efficacy and individual empowerment. The first intervention (E1) consisted of usual care combined with short individualized patient counseling sessions after clinic visits. The second intervention (E2) involved usual care with a computerized appointment reminder patient tracking system. The third condition comprised usual care combined with home visits and opportunities to take part in discussion groups (E3). The remaining participants received the usual care provided by the hypertension clinic.

Modifying the Clinic Environment to Improve Adherence Patient satisfaction with care has been identified as an important component of patient compliance with treatment.30 Elements of care that are implicated in reduced patient satisfaction, decreased appointment keeping, diminished treatment compliance, and discontinuance of care are poor provider-patient communication and long waiting times.31 Before the inception of CHIP, as many of 45% of scheduled appointments at the hospital clinic resulted in “no-shows.” Evaluation of the clinic environment suggested that several aspects of care were undesirable, including block scheduled appointments and accompanying long waiting times and a lack of continuous care from a designated physician. Furthermore, limited opportunities were afforded patients to communicate with staff concerning their health and treatment. In procedures equally affecting all participants, structural alterations in clinic operations were initiated, including eliminating block appointment scheduling and replacing it with individualized appointment times, increasing the staff ratio, providing educational videos and counseling sessions during waiting periods, increasing patient-provider contact, and assigning patients to a specific physician for care. These structural alterations in the clinic’s operations were expected to improve clinic accessibility and attractiveness to patients and increase patient satisfaction with care, enhancing treatment compliance and medical outcomes.

Community Health Workers Counseling and home visits were provided by community health workers (CHW), who were trained according to American Heart Association guidelines32 and certified for blood pressure measurement and monitoring. Their interactions with patients included providing instructions for treatment and medication protocols and patient education regarding diet, exercise, smoking cessation, stress management, and other lifestyle modifications. CHW additionally provided information on community resources that could be accessed by participants to provide reinforcement for the reduction of cardiovascular risk, such as smoking, weight management, or exercise programs. CHW fluent in Spanish were assigned to Spanish-speaking CHIP participants.

MATERIALS AND METHODS

Participants Thirteen hundred and sixty-seven patients (more than 98% of the patients approached) agreed to participate in CHIP. One thousand one hundred and nineteen attended one of the three clinics at the teaching hospital and the remaining 248 participants were patients of the HMO clinic center, a privately managed health organization in the same community. The sample was representative of the ethnic and socioeconomic breakdown of the surrounding population area. Demographics of the sample are found in Table 1.

Procedure Human subjects approval was obtained from the UCLA and King/Drew Medical Center Institutional Review Boards. Participants were recruited during regularly scheduled appointments at the medical center and private clinic. Project staff explained the program to each patient and he or she was asked to take part in the study. Individuals who consented to participate completed the baseline interview with a community health worker at the end of that clinic visit. Participants were randomly assigned to one of the three intervention conditions or to the usual care condition.

E1: Individualized Patient Counseling (Exit Interviews) Participants in the exit interview condition met with a community health worker after each clinic visit for a 5-
to 10-min counseling session designed to reinforce patients’ medication-taking and appointment-keeping behaviors. During this session the patient’s understanding of the treatment regimen was ascertained. Compliance with the prescribed regimen was reinforced, specifically by using culturally sensitive techniques to help the patient to adapt the regimen to his or her schedule and teach cues to facilitate medication-taking behaviors (eg, taking medicine each morning when brushing one’s teeth) and adherence to other aspects of treatment (eg, maintaining a lower-sodium diet).

E2: Tracking The second condition focused on appointment keeping as a critical component of blood pressure treatment/control. Participants in the tracking condition were mailed appointment reminder cards 10 days before scheduled appointments. Telephone reminders were provided 3 days before scheduled appointments. Patients were also telephoned after missed appointments to reschedule.

E3: Home Visit/Discussion Group This condition centered on providing continuity of care between clinic and the patients’ home lives. Participants in this condition received home visits from a CHW to encourage family members to provide support for the home management of lifestyle and medication compliance. Participants in this treatment were given further opportunities to participate in discussion groups concerning the amelioration of cardiovascular risk factors such as weight loss, smoking cessation, etc. Participation in discussion groups was voluntary.

Usual Care After their agreement to participate in the program and completion of the baseline interview, individuals assigned to the usual care condition continued to receive the care typically delivered at the clinics.

Baseline Questionnaire All participants completed a self-report baseline interview, which assessed demographic information, medical history and comorbidities, pertinent health behaviors (eg, exercise, alcohol use, and smoking), and appointment keeping and medication compliance. A number of psychosocial factors known to be related to treatment adherence were also evaluated, including satisfaction with medical care, social support, stress, difficult life circumstances, experience of discrimination, health locus of control, and general self efficacy/coping.

Medical and Other Data Blood pressure and other medical data were collected during clinic visits and through chart reviews over the course of the study. A record of appointments made and appointments broken or changed was kept for each patient. The content of the exit interviews was recorded for participants in condition E1, and home visit and discussion group attendance was recorded for condition E3 participants.

RESULTS

CHIP Participants Demographic Status Of the 1367 individuals who agreed to participate in CHIP, 40.8% were men and 59.2% women. The average age of participants was 53.5 (sd = 12.0) years. About 12% of participants were 18 to 39 years old, 26% were 40 to 49 years old, 33% were 50 to 59 years old, and about 29% were older than 60 years of age. The sample was predominantly black (77%), with most of the remaining participants self-identifying as Hispanic (21%); about 3% were Asian-American, Euro-American, or other. Most participants reported living alone, either divorced or separated (28%), widowed (14%), or never married (27%). The remaining participants were either
TABLE 2. BASELINE MEDICAL AND HEALTH BEHAVIOR OF CHIP PARTICIPANTS (N = 1367)

<table>
<thead>
<tr>
<th>Medical Characteristics</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>17%</td>
</tr>
<tr>
<td>Heart condition</td>
<td>21%</td>
</tr>
<tr>
<td>Renal dysfunction</td>
<td>12%</td>
</tr>
<tr>
<td>Stroke</td>
<td>11%</td>
</tr>
<tr>
<td>Previously diagnosed HBP</td>
<td>80%</td>
</tr>
<tr>
<td>Taking BP medicine</td>
<td>85%</td>
</tr>
<tr>
<td>Health/risk behaviors</td>
<td></td>
</tr>
<tr>
<td>Smoked in the past</td>
<td>35%</td>
</tr>
<tr>
<td>Currently smoking</td>
<td>11%</td>
</tr>
<tr>
<td>Some alcohol use</td>
<td>30%</td>
</tr>
<tr>
<td>Alcohol, special occasions</td>
<td>21%</td>
</tr>
<tr>
<td>Frequent alcohol use</td>
<td>14%</td>
</tr>
<tr>
<td>Eat fast-food once a week</td>
<td>33%</td>
</tr>
<tr>
<td>Usually/always salt food</td>
<td>59%</td>
</tr>
<tr>
<td>Not exercised past month</td>
<td>58%</td>
</tr>
<tr>
<td>Some exercise past month</td>
<td>42%</td>
</tr>
<tr>
<td>Exercise at least once/week</td>
<td>28%</td>
</tr>
</tbody>
</table>

CHIP, Community Hypertension Intervention Program; HBP, high blood pressure.

married (26%) or living with someone (5%). The majority of the participants were poorly educated—49% did not complete high school and 40% had a high school diploma—and low income—more than half of the sample reported income levels less than $5000 per year, and an additional 37% reported earning between $5000 and $14,000 per year. Most of the participants either had no health insurance (30%) or had health coverage provided by public assistance programs such as Medi-Cal/Medicaid (54%) (Table 1).

Health Status At the time of baseline measurement, the CHIP participants’ systolic blood pressure readings ranged from 115 to 211 (M = 152, sd = 23) mm Hg and diastolic blood pressure from 70 to 120 (M = 91, sd = 14) mm Hg. At this time, only about 35% of the sample had blood pressure considered to be under control (diastolic < 90 mm Hg and systolic < 140 mm Hg, according to the current definition of hypertension by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, NHLBI, 1997), whereas 65% of the participants’ blood pressure was not under control (Table 2).

Seventeen percent (17%) of the participants reported having been diagnosed with diabetes, 21% reported having a “heart condition or trouble,” 11% reported having had a stroke, and 12% reported kidney damage. A total of 545 participants reported one or more of these comorbidities. Of these individuals, 67% reported one coexisting illness, 26% reported two, and 7% reported having been diagnosed with three or more of these additional illnesses. Average diastolic (t [1153] = 7.1, P < 0.0001) and mean arterial (MAP) blood pressure levels (t [1153] = 3.4, P < 0.001) of individuals with diabetes were significantly lower than those of individuals without diabetes. There were no differences in mean blood pressures for individuals with kidney disease, heart conditions, or stroke, compared with individuals who did not have target organ damage. The total number of comorbid conditions per participant was not related to baseline blood pressure nor to blood pressure control.

Most CHIP participants were already receiving treatment for hypertension at baseline. Eighty percent (80%) of the participants had been previously diagnosed as having high blood pressure, with a mean length of diagnosis of 9.24 years (sd = 8.8 years). Eighty-five percent (85%) of participants reported taking prescription blood pressure medication, and the average length of time participants had been taking medication for their hypertension was 8.4 years (sd = 8.2 years).

Health and Risk Behaviors Table 2 shows the baseline health and risk behaviors of the CHIP participants. Although 35% of the participants reported having smoked in the past, only 11% reported currently smoking. Thirty percent of the participants reported some alcohol use during the last month, with about 21% reporting drinking only on special occasions, and 14% reporting frequent alcohol use. One-third (33%) of the CHIP participants reported eating at fast-food restaurants at least once a week, and 59% reported usually or always using salt on their food. Furthermore, 58% of the participants stated that they had not exercised at all during the previous month. Of the 42% of the sample who had engaged in some form of exercise during the month, only 28% reported exercising at least once per week.

DISCUSSION

The Community Hypertension Intervention Project enrolled more than 1300 patients from three hospital-based clinics and one HMO clinic from the community in a randomized study of three interventions designed to improve appointment attendance, increase treatment adherence, and encourage and maintain lifestyle changes, so as to improve blood pressure outcomes. In light of current statistics illustrating that as few as 25% to 50% of patients undergoing treatment for hypertension demonstrate controlled blood pressure levels,

CHIP is designed to evaluate which single intervention(s) effectively increase adherence to hypertension treatment recommendations and produce concomitant improvements in patients’ blood pressure. The design of the three CHIP interventions—exit interviews, appointment tracking, and home visits/discussion
groups—is strongly rooted in theories of health education and behavior change, emphasizing the development of psychosocial characteristics that encourage health behavior improvement, eg, improving patients’ knowledge as to the benefits of treatment and increasing their feelings of self-efficacy, increasing the influence of social support and norms by encouraging participation of supportive family member(s), and decreasing barriers to and increasing perceived benefits of treatment.

CHIP participants were recruited to represent the population segment at highest risk for hypertension and its clinical sequelae: low-income, minority adults. Participants were predominantly black and Hispanic, two cultural groups that demonstrate more medical indicators of hypertension than other population groups, including higher average blood pressure and higher levels of disorders related to hypertension such as diabetes, stroke, and renal disease. These cultural/ethnic groups are also more likely to be overweight, and to smoke and drink alcohol more than other groups, characteristics that greatly add to their risk of later morbidity and mortality due to hypertension and its resultant health problems. Baseline analyses demonstrate that many of the CHIP participants demonstrate behaviors that put them at higher risk for hypertension, whereas most participants are engaging in relatively low levels of healthy behaviors, such as exercise, which are known to improve blood pressure control. The CHIP participants tend to have very low incomes, to be un- or underinsured, and to be poorly educated, characteristics that have been associated with hypertension and its negative consequences.

At baseline, most CHIP participants did not have blood pressure levels considered to be medically under control, demonstrating an unequivocal need for the development of interventions to improve management of their hypertension. Furthermore, in this sample, reduced treatment compliance was associated with higher baseline blood pressure. These findings suggest that this population will benefit from the targeted interventions presented in the CHIP trials. The CHIP interventions, which focus on increasing social and familial support, improving stress management, enhancing coping skills, and providing cues and strategies for improving compliance, should improve self-management of hypertension, ameliorating the current low rates of blood pressure control in this underserved minority population.

REFERENCES

20. Sherbourne CD, Hays RD, Orway L, DiMatteo MR, Kravitz RL: Antecedents of adherence to medical rec-


