

# A MODEL OF PSYCHOSOCIAL AND CULTURAL ANTECEDENTS OF BLOOD PRESSURE CONTROL

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Hypertension is a major modifiable risk factor for stroke, congestive heart failure, and end-stage renal disease. Hypertension is particularly prevalent and deadly among African Americans. Effective treatment for hypertension has been available for decades, yet only one fourth of all individuals have their blood pressure under control. Despite the potential impact of hypertension, interventions to improve control have had limited success. We present a model of how to understand antecedents of blood pressure control according to three interrelated categories: patient characteristics, social and cultural environment, and medical environment. This theoretical paper was conducted using a literature review and a model to explain psychosocial antecedents of blood pressure control is presented. We conclude that improved understanding of important antecedents of blood pressure control coupled with technological advances, such as tailored interventions, provide clinicians with a tool that may lead to improved blood pressure control. These interventions will require the involvement of clinicians and consideration of sociocultural factors to be successful. (*J Natl Med Assoc.* 2002;94:236-248.)

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 psychosocial factors ♦ social  
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 ♦ adherence ♦ interventions

Hypertension is the major modifiable risk factor for stroke and one of the major risk factors for coronary heart disease, congestive heart failure, and renal disease. These diseases

increase in prevalence and incidence with age<sup>1-3</sup> and are more prevalent among African Americans.<sup>4-6</sup> Age-adjusted stroke rates have risen slightly since 1993, and the rate of decline in coronary heart disease appears to be leveling.<sup>7</sup> The incidence of end-stage renal disease has increased, for which blood pressure (BP) is the second most common antecedent.<sup>8</sup> The prevalence of heart failure, in which the large majority of patients have antecedent hypertension, has also increased.<sup>9</sup> The increased incidence and prevalence of these diseases may reflect worsening rates of BP control in hypertensive patients. African Americans are more susceptible to these diseases than other races.

There are approximately 50 to 60 million Americans with hypertension, and the prevalence of hypertension in adults 65 years of age

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**Table 1. National Data on Awareness, Treatment, and Control of Hypertension\***

	NHANES II (1976-1980)	NHANES III (Phase I) (1988-1991)	NHANES III (Phase 2) (1992-1994)
Awareness	51%	73%	68.4%
Treatment	31%	55%	53.6%
Control†	10%	29%	27.4%

\* SBP below 140 mm Hg and DBP below 90 mm Hg.

† Data are for adults age 18 to 74 years with SBP of 140 mm Hg or greater, DBP of 90 mm Hg or greater, or taking antihypertensive medications.

‡ SBP, systolic blood pressure; DBP, diastolic blood pressure.

and older exceeds 50%.<sup>10</sup> The prevalence of hypertension in African Americans is among the highest in the world.<sup>5,6</sup> Although there have been improvements in terms of awareness, treatment, and control of hypertension between the National Health and Nutrition Examination Survey (NHANES) II and NHANES III, phase 1, BP control in hypertensive patients remains low, and rates have not improved or have worsened between NHANES III, phase 1, and NHANES III, phase 2 (see Table 1). On average, only approximately one fourth of all hypertensive patients have their BP under effective control,<sup>11,12</sup> and although age-adjusted prevalence of hypertension is 40%–50% higher in African Americans compared with whites, an equal percentage of African Americans and whites have poor BP control.<sup>12</sup> The Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) defines BP control as less than 140/90 mm Hg and 130/85 mm Hg for diabetics.<sup>11</sup>

### **A MODEL OF PSYCHOSOCIAL AND CULTURAL FACTORS EXPLAINING POOR BLOOD PRESSURE CONTROL**

Although there have been many empirical studies examining poor BP control, a comprehensive model of psychosocial and cultural factors related to poor control is lacking. A clear understanding of psychosocial and cultural factors has not been forthcoming, in part because

most studies of antecedents of poor BP control have focused on narrow measures,<sup>1,13,14</sup> adherence for one single-treatment modality,<sup>15,16</sup> or have not paid attention to sociocultural factors. Without a comprehensive model, interventions to improve BP control and decrease health risks and costs can not be effectively designed because potentially important interactions that influence poor control may be missed.

This comprehensive model can be organized by grouping contributing factors according to three general categories: patient characteristics, social-cultural environment, and medical environment (Table 2). Although there are known clinical factors (e.g., type of antihypertensive medication, salt intake, alcohol use, smoking, etc.) and provider behaviors (i.e., following evidence-based guidelines) related to BP control, we will not review them here given the amount of attention they have received previously. Rather, we will focus on the psychosocial and cultural factors related to poor BP control because of the inability of clinical and provider factors to improve BP control.

The review will focus on BP control as an outcome measure when possible, as opposed to adherence, because the use of treatment adherence is problematic for three major reasons. First, the focus on adherence is devoted to examining particular patient characteristics and neglects cultural, medical, and physician characteristics that impact hypertension control. Second, there is no agreed upon “gold standard” measure of adherence. Third, there is evidence that in some situations, patients who adhere to treatment regimen may still maintain poor BP control; adherence is not synonymous with control.

We present a model that explains the antecedent factors of BP control based upon a review of the literature. This model will help clinicians and health care systems identify and address these psychosocial and cultural factors to achieve better BP control for their patients. We conducted a literature review using Medline, Psycinfo, and Pubmed, cross-referencing terms such as psychosocial factors, cultural fac-

tors, and social factors with blood pressure. We limited the search from 1995 through 2001 and examined articles that included humans and were written in English. This resulted in 594 articles that were reviewed and used to help formulate a model for identifying psychosocial and cultural factors related to blood pressure control.

## PATIENT CHARACTERISTICS

### Demographic Factors

Hypertension is common in older Americans; among Americans age 60 and older examined in the NHANES III, elevated BP was found in approximately 60% of non-Hispanic whites, 71% of non-Hispanic African Americans, and 61% of Hispanic Americans.<sup>12</sup> Although hypertension is related to increased age, there are relatively few gender differences in terms of prevalence. In addition, large, long-term clinical trials of antihypertensive treatment have not demonstrated clinically significant sex differences in BP response and outcomes.<sup>17</sup>

Treatment nonadherence tends to increase as the number of medications taken increases, suggesting that nonadherence and subsequent poor BP control may be a greater problem for the elderly. The elderly are at increased risk of poor BP control because of the increased likelihood of multiple medication usage as a result of increased disease comorbidities, including more severe hypertension.

The prevalence of hypertension in African Americans is among the highest in the world. Compared with whites, hypertension develops earlier in life and average blood pressures are much higher in African Americans. African Americans also have higher rates of stage 3 hypertension (Systolic BP >180 or Diastolic BP >110 mm Hg) than whites, causing a greater burden of hypertension complications.<sup>12,18</sup> This earlier onset, higher prevalence, and greater rate of stage 3 hypertension in African Americans is accompanied by an 80% higher stroke mortality rate, a 50% higher heart dis-

ease mortality rate, and a 320% greater rate of hypertension-related end-stage renal disease than seen in the general population.<sup>5,6</sup> Available evidence indicates that African Americans receiving adequate treatment will achieve overall declines in BP and may experience a lower incidence of cardiovascular disease, similar to whites.<sup>19,20</sup> Although African Americans are more likely to be affected by hypertension, ample evidence suggests that environmental modifiers and other factors such as access to health care, socioeconomic status, racism, stress, salt intake, alcohol, age, gender, and obesity account for some of the racial/ethnic differences in hypertension prevalence worldwide.<sup>21</sup> No unifying hypothesis about the impact of environmental factors on hypertension has evolved.<sup>4</sup>

Individuals with low income and patients with low levels of education<sup>22</sup> are more likely to be nonadherent and subsequently lack BP control. Race and socioeconomic status in these situations, however, often are associated with increased barriers to care such as lack of insurance,<sup>23</sup> decreased likelihood of having a regular source of care,<sup>24,25</sup> or reporting cost of antihypertensive medications as being a deterrent,<sup>25,26</sup> which are all factors related to worse hypertension control.

### Perceived Risk of Hypertension

Before individuals can decide what to do about their hypertension, they need to be aware that they have the disease. As seen in Table 1, only 68% of those sampled in the NHANES II (1992–1994) were aware that they had hypertension, and only 54% of these individuals were being treated for hypertension.<sup>12</sup> The probability that advice will be followed is a function of the patient's perceptions of susceptibility to the disease, the likely severity (clinical and social) of the disease, and the benefits and barriers likely to be encountered as a result of the recommended action. Stason and colleagues<sup>27</sup> found that patients who received more intense treatment regimens or suffered complications of hypertension were more likely

to remain in Veterans Affairs Hypertension Screening and Treatment Clinics. This is consistent with the assertion that factors that increase the salience of disease also increase adherence. The salience of hypertension, however, is often difficult for patients to envision due to lack of substantial immediate benefits of antihypertensive medication and the asymptomatic nature of the disease. Patients must believe that, by following a particular set of health recommendations, they will abolish or at least reduce the threat or severity of hypertension and its consequences. Finally, patients must believe in the efficacy of the treatment.<sup>28,29</sup>

### **Motivation**

Motivation encompasses self-regulatory processes involving the selection, activation, and sustained direction of behavior toward certain goals.<sup>30</sup> Numerous theoretical perspectives have been proposed to better understand human motivation. Among them, the health belief model<sup>31,32</sup> and the social cognitive theory,<sup>33</sup> have received a great deal of attention.

People take action when they perceive they are susceptible to a health threat and that, when considering the course of action available, they weigh the benefits and barriers or "pros" and "cons" to make a decision.<sup>31,32</sup> Similarly, Bandura's social cognitive theory<sup>30</sup> assigns a pivotal role to self-regulative processes in which beliefs about the outcomes of behaving in a certain way are considered. According to the social cognitive theory, people adopt a behavior, such as increasing their physical activity level or taking their antihypertensive medication when scheduled, if they believe that they have much to gain and little to lose.

A key element of social-cognition theory is the concept of self-efficacy, which involves a judgment of one's abilities to meet a goal.<sup>30</sup> According to Bandura,<sup>30,33</sup> self-efficacy contributes to motivation in several ways: (1) shaping aspirations and goals; (2) determining the amount of effort and perseverance one will expend in a given endeavor; and (3) shaping

the outcomes expected from one's efforts. People who perceive themselves as being highly efficacious will expect favorable outcomes, whereas those with less confidence in their performance capabilities will envision negative outcomes.<sup>34,35</sup> Support for the importance of self-efficacy in BP control comes from several studies showing that lower levels of self-efficacy are associated with higher heart rate, elevated BP, and serum catecholamine levels in threatening situations.<sup>36-38</sup> Gerin et al.,<sup>38</sup> for example, reported in a sample of 40 subjects engaged in a mental arithmetic task that subjects with low self-efficacy for the mental arithmetic task evidenced cardiovascular changes that were significantly greater than those of the high self-efficacy group 8.0 vs. 14.8 mm Hg (systolic blood pressure), and 2.7 vs. 6.1 mm Hg (diastolic blood pressure).

### **Avoidance Coping Style**

Studies of patients with serious medical conditions such as hypertension find that those who do not comply with medical advice tend to show a strong use of defense mechanisms.<sup>39,40</sup> Patients who report using avoidance coping strategies (e.g., hoped for a miracle) tend to be less likely to adhere to doctor's recommendation and advice.<sup>41</sup> Initially, this strategy may be adaptive by preventing the individual from becoming overwhelmed or anxious about the disease.<sup>42</sup> Denial, however, has been related to long-term resistance to adherence and poor outcomes.<sup>43-46</sup> Avoidance coping itself may take maladaptive paths, such as excessive drinking or drug use. It is beneficial for the clinician to know something about the patient's coping style, especially those styles that may interfere with treatment.<sup>47</sup> Unfortunately, little research has been conducted examining the relationship of coping style and BP control.

### **Health-Related Literacy**

There is evidence to suggest that a large percentage of patients, particularly the elderly, do not understand directions. In the National Adult Literacy Study, a cross-sectional study of

the United States population, the proportion of Americans who read at the lowest reading level ranged from 16% among those 45 to 54 years old to 26% among those 55 to 64 years old, to 44% among those age 65 and older.<sup>48</sup> In terms of health-related issues, Williams<sup>49</sup> found that only 42% of the patients in two public hospitals understood directions for taking medication on an empty stomach, and 26% were unable to understand information regarding when a next appointment was scheduled. Basic skills in reading are particularly important in the health care setting in which patient participation in planning and implementing therapeutic regimens is critical for success. Functional health literacy means being able to read and understand health-related materials such as prescriptions, appointment cards, medicine labels, and directions for home health care.<sup>50</sup> Besides being prevalent, functional health illiteracy is related to poorer health status,<sup>51,52</sup> less health-promoting behaviors,<sup>53</sup> poorer knowledge of hypertension,<sup>54</sup> and in one study, higher systolic BP (155 mm/hg vs. 147 mm/hg).<sup>54</sup>

In addition to literacy, patients must be able to integrate information and make inferences about treatment directions. If a patient, for example, is required to take a beta blocker two times a day and the individual takes the pill at 8 AM, the patient must infer that she must take the next pill at 8 PM. Although there is ample research documenting the importance of health-related literacy and treatment adherence, limited research has been conducted to assess the impact of low literacy on maintaining specific hypertension-treatment regimens.

### Memory

Besides understanding the purpose and treatment direction of regimens, patients must remember to engage in these activities. Memory plays an important role in hypertension control, especially for older adults. Declines in memory function have been documented and may contribute to missed doses.<sup>55,56</sup> Furthermore, because older adults may be more likely

than younger adults to be prescribed multiple medications, the process of taking medication correctly may be particularly difficult for older patients because of the cognitive demands required for organizing and maintaining complex medical regimens.<sup>57</sup> In fact, it has been estimated that patients recall only approximately 50% of what they are told by their providers.<sup>58,59</sup> In data from the Framingham Heart Study, Farmer et al.<sup>60</sup> reported a strong graded relation between cognitive performance, including memory, and the probability of having stopped antihypertensive medication use; those in the lowest 10th percentile of education-adjusted cognitive performance were more than three times as likely to have stopped treatment than those in the normal performance group. In the Medical Outcome Study, recall of taking medications regularly was high (95%), but recollection of advice to change life-styles (e.g., follow a low-salt diet, 74%; exercise regularly, 63%; and cut down on stress, 37%) was substantially lower.<sup>16</sup>

### Side Effects of Antihypertensive Medication

Medication nonadherence is a barrier to hypertension management because hypertension has few symptoms and is seemingly "invisible" to the individual, yet the patient feels medication side effects. Physicians rarely assess patients' experience with medication side effects. A recent study reported that nearly half of all patients in a primary care setting were not asked about how their medications were helping, and that more than two thirds of the patients were not asked any questions about barriers to taking medications or side effects related to medication.<sup>61</sup> These results have important clinical implications, especially because many patients are reluctant to ask physicians about their medication<sup>61</sup> and antihypertensive drugs may cause undesirable symptoms. Donovan and Blake<sup>62</sup> reported that the most common reason for not taking drugs or dosages prescribed is patients' fear of side effects. Many antihypertensive agents may impair sexual function.<sup>63</sup> Centrally acting drugs may impair mental

acuity, and beta blockers may reduce exercise tolerance. Older adults may be at increased risk for side effects from antihypertensive medications, based on differences in pharmacokinetics (i.e., drug metabolism) and pharmacodynamics (i.e., increased sensitivity).<sup>64</sup>

The proportion of hypertensive patients who change or discontinue treatment because of side effects is difficult to estimate. For patients enrolled in clinical trials, data suggests that discontinuation occurs in approximately 15% of patients randomized to angiotensin-converting enzyme inhibitors, 15% to 20% of those taking diuretics, 20% to 25% of those taking beta blockers after 6 months to 1 year of treatment,<sup>65</sup> and 20% using calcium channel blockers after 4 years of treatment.<sup>66</sup> There is little effectiveness data about medication side effects as reasons for discontinuation of treatment. The rates of discontinuation, however, are likely to be higher in practice than they are in clinical trials. Medication side effects are more likely to indirectly influence BP control by decreasing medication adherence.

### Depression

Depression not only is directly related to increased cardiovascular-related outcomes,<sup>67,68</sup> but also is related to nonadherence with medical treatment. Although limited research has been conducted examining the direct affects of depression on hypertension treatment adherence, the relationship of depression and treatment adherence has been examined for antidepressant treatment. DiMatteo et al.<sup>69</sup> for example, reported that the relationship between depression and nonadherence to antidepressant treatment was substantial, with an odds ratio of 3.03 (95% confidence intervals = 1.96–4.89). Depression may increase nonadherence with treatment for multiple reasons. First, positive expectations and beliefs in the benefits and efficacy of treatment have been shown to be essential to patient adherence.<sup>70</sup> Depressed patients often feel hopeless, and adherence might be difficult or impossible for a patient who holds little optimism that any ac-

tion will be worthwhile. Second, considerable research<sup>71,72</sup> suggests the importance of support from the family and social network in a patient's attempts to adhere to medical treatments. Considerable social isolation and withdrawal from the very individuals who would be essential in providing emotional support and assistance often accompanies depression. Third, depression might be associated with reductions in the cognitive functioning essential to remembering and following through with treatment recommendations (e.g., taking medication). Although depression affects adherence, its affect on BP control is less clear.

### SOCIAL/CULTURAL ENVIRONMENT

Racial and socioeconomic status (SES) disparities related to adherence to prescribed behavioral and medical regimens are often based on financial, logistical, and cultural barriers. Although not unique to minorities or the poor, these disparities occur more frequently or have greater impact in poor and minority communities. Low SES has been associated with higher BP and higher rates of cardiovascular disease.<sup>73,74</sup> Colhoun et al.,<sup>74</sup> for example, reported that in examining data from 1966 to 1996, lower SES was associated with higher mean BPs in almost all studies in developed countries. This inverse gradient was both stronger and more consistently found in women than in men. The magnitude of the association varied, but generally was quite small, with age-adjusted mean systolic BP differences of approximately 2 to 3 mm Hg between the highest and lowest SES groups. This small difference in BP, however, is important at the population level.

Minority groups and people living in poverty encounter many stressors, both physical and psychological, on a daily basis. As a consequence of historical factors and the continued race consciousness of society, African Americans currently experience a greater array of stressors compared with whites. These chronic socioecological stressors include, among others, higher unemployment, higher poverty rates and lower income levels, lower status oc-

cupations and lower social status, residential crowding, and substandard housing.<sup>75-77</sup> Many of these chronic social and environmental stressors have been associated with hypertension among African Americans.<sup>78</sup>

Racism has been found to be directly related to increased blood pressure.<sup>79,80</sup> In the CARDIA survey study, systolic blood pressure, for example, among working-class African-American adults reporting that they typically accepted unfair treatment and had experienced more racial discrimination was approximately 7 mm Hg higher than among those reporting that they challenged unfair treatment and experienced less racial discrimination. Among professional African-American adults, systolic blood pressure was 9 to 10 mm Hg lower among those reporting that they typically challenged unfair treatment and had not experienced racial discrimination.<sup>80</sup>

Shift work, which is performed by disproportionate numbers of minorities and people from lower socioeconomic strata, frequently results in sleep deprivation. Lack of sleep is emerging as an important contributing factor to cardiovascular disease and diminished mental and physical health and may also play an important role in adherence to prescribed health recommendations and subsequent poor blood pressure control. Bosworth conducted reviews of the effects of other ecological factors on hypertension and treatment adherence.<sup>81,82</sup>

There are cultural barriers that are likely to influence BP control. These cultural barriers include mistrust by some minority groups of medical personnel and medical systems,<sup>83,84</sup> lack of cultural sensitivity on the part of health care providers, and differences between patients and health care providers regarding the meaning and importance of an illness, its causes, consequences, and treatment. Cultural practices and health knowledge and beliefs are all important determinants of the effectiveness of patient-physician interactions. Physicians may not fully recognize educational, social, cultural, or economic barriers to routinely prescribed therapy. Similarly, a patient's expecta-

tions and understandings of the physician or health provider's role may present additional obstacles. Issues such as the legacy of racial segregation, stigma associated with disease, and mistrust of health care facilities tend to alienate minorities from medical systems.

### **Trust in the Medical Care System**

The seeking of medical care is associated with patients' trust that their health care providers are competent, take appropriate responsibility and control, and give their patients' welfare the highest priority.<sup>83</sup> Trust in one's health care provider makes possible an openness of communication that facilitates the exchange of information. Potential effects of a decline in patient-provider trust include lower likelihood of timeliness of seeking of medical care, lower patient and physician satisfaction, an increased disenrollment from health plans, and poorer patient adherence to treatment recommendations.<sup>84</sup>

### **Social Support/Social Network**

Increased social support has been found to be associated with decreased mortality<sup>85</sup> and less hospital expenditure.<sup>86</sup> Furthermore, perceived social support, either from family members<sup>87,88</sup> or from health care provider,<sup>88,89</sup> is related to medication adherence. Support from one's social network may provide necessary information, encouragement, or logistic means for ensuring medication adherence as well as increasing the likelihood of individuals seeking preventive health care services such as hypertensive screening and treatment. In addition, social support has been found to have both direct and indirect stress-buffering effects on resting blood pressure<sup>90</sup> and on cardiovascular reactivity.<sup>38,91,92</sup> Strogatz et al.,<sup>90</sup> for example, reported that differences in systolic blood pressure associated with low emotional and instrumental support ranged from 3.6 to 5.2 mm/Hg in women and 3.4 to 2.5 mm/Hg in men as compared to those reporting high emotional and instrumental support. Similar pat-

terns were observed for diastolic blood pressure.

## MEDICAL ENVIRONMENT

### Access to Care

Barriers to care and control of cardiovascular risk factors, especially high blood pressure, are well recognized<sup>24,93-95</sup> and exist at the patient, provider, and organizational levels.<sup>96</sup> Many individuals from lower socioeconomic strata lack health insurance and are unable to afford required medical devices and medications. The cost of therapy, the medical visit, and the time off from work may significantly reduce disposable income. Good health may become a low priority for the patient and/or the patient's family because of competing needs and limited resources. In addition to limited resources, health personnel and facilities must be available where people live and work. People must have the knowledge and means to get to those services and make use of them. In addition, not having access to a regular source of primary care has been consistently found to be associated with untreated and uncontrolled hypertension, later diagnosis and greater severity of illness.<sup>24,97,98</sup>

### Healthcare Provider-Patient Relationship

There are several compelling reasons to consider the effectiveness and to identify ways to improve physician-patient communication, especially in the management of a chronic disease such as hypertension. First, many patients want a more active role in their medical care. Patients of physicians who involve them in treatment decisions have better health outcomes, both in psychological and functional status, than those whose physicians do not.<sup>99,100</sup> Furthermore, patients who feel that they have participated in decision making are more likely to follow through on those decisions than those who do not.<sup>101,102</sup> Second, hypertension requires substantial responsibility by the patient for implementing treatment regimens settled on during the physician-patient visit. Effective

physician-patient communication must include the transfer of sufficient information to hypertensive patients to permit them to implement the treatment regimen correctly, and equally important, must persuade patients that the agreed upon regimen should be carried out.<sup>100</sup> Conversely, short, impersonal consultations in which the patient's expectations remain unfulfilled have a detrimental effect on control.<sup>27</sup> Hall,<sup>103</sup> for example, observed greater adherence among patients of physicians who communicated positively (e.g., gave reassurance, support, and encouragement) and refrained from negative communications (e.g., anger and disapproval). Kaplan<sup>100</sup> reported that hypertensive patients whose physicians were less controlling or who allowed more patient participation during the office visits had better functional status and lower follow-up BP than patients of more controlling physicians.

## INTERVENTIONS

Given the multitude of factors associated with BP control in patients with hypertension, what factors should interventions focus on to enhance control? A review of the medical literature reveals that no single-intervention strategy will assure either adherence or control.<sup>104,105</sup> Roter et al.<sup>106</sup> conducted a meta-analysis of methods to enhance adherence. They evaluated education, behavioral, or provider interventions that specifically targeted adherence in patients with hypertension. The influence of these interventions as measured by summary effect size varied across outcome adherence measures. The effect size of these interventions on actual BP was 0.16, which is considered small.<sup>107</sup> Although this effect size is small, it does indicate clinically significant improvements in disease management. Interventions that focus not only on adherence but also on BP control need to be considered because of the increased prevalence of many hypertension-related diseases such as strokes, end-stage renal disease, and heart failure.<sup>7-9</sup> More intensive, comprehensive approaches that combine several adherence-promoting strategies appear



to be more successful than independent strategies.<sup>106,108</sup> Tailoring the intervention to address the individual's reasons for not adhering may also be helpful. Furthermore, as interventions are refined, consideration of racial/ethnic differences in factors related to hypertension control need to be considered.

## FUTURE DIRECTIONS

Given higher expectations on the number of patients to be seen per day, physicians have less time to communicate effectively, and they need accurate, current information about their patients. Advances in computer technology in the 1980s permitted the development of tailored communications, paralleling trends in marketing, referred to as customer-specific marketing.<sup>109</sup> Tailored health communications are likely to be an important component of future interventions because they can facilitate positive patient-provider communications and foster behavioral changes conducive to health. Specifically tailored telephone counseling and tailored print communications are targeted for individuals based on information about that particular person and his or her needs.<sup>109</sup> Over the past several years, the results of different studies of tailored communications in a variety of settings have been reported.<sup>110-113</sup> Overall, the studies have demonstrated that tailored print interventions are more effective than generic health education materials, particularly for some important high-risk populations, such as people with low income and African Americans.<sup>110-113</sup> Generally, the tailored communications have resulted in positive changes in one or more health behaviors.<sup>114</sup>

We are conducting a study, the Veterans Study to Improve the Control of Hypertension Study (V-STITCH), a nurse-administered tailored intervention to improve blood pressure. This 4-year randomized controlled trial will occur in a primary care setting among 544 diagnosed hypertensive veterans. Given the multitude of factors related to BP control, our intervention involves eight standardized telephone modules administered by a nurse case

manager. The modules consist of literacy, hypertension knowledge, memory, social support, patient/provider communication, missed appointments, and health behaviors. The computer-based intervention is an Access database with windows interface. The database consists of algorithms to ensure that each module that is problematic for the patient is tailored to their needs. For example, the literacy module is activated for baseline functionally illiterate patients when medications are changed; the intervention involves verbally explaining patients' medication instructions to both the patient and family member. Another example is the hypertension knowledge module; general information for everyone determined to lack essential hypertension information at baseline is provided, but the module also provides information tailored to each patient's risk profile (i.e., diabetic, African American). The database has the flexibility to consistently assess patients' hypertension needs and if a problem is determined, the particular module is activated at the nurse's next call. The intervention tracks information discussed at each phone call to provide a full understanding of the tailored intervention processes.

This nurse-administered tailored intervention is an innovative approach to enhance patients' adherence with prescribed hypertension regimen. Because it is telephone- and computer-based, it is easy to implement. Despite the known risk of poor BP control, many adults still do not have their BP under effective control. This study is an important step in testing the effectiveness of a patient intervention to improve BP control among older adults.

## SUMMARY AND CONCLUSIONS

Blood pressure control remains poor in that only 25% of all hypertensive patients ever achieve a BP  $\leq$ 140/90 mm Hg.<sup>11,12</sup> This is particularly problematic because those who lack BP control are at significantly greater risk for stroke, heart disease, and other related diseases. Potential factors that may influence poor BP control were discussed within the context of

Table 2. Summary of Antecedents of Blood Pressure Control

Antecedents	Association Between Characteristics and BP Control
Patient Characteristics	
Demographic factors	
Race	African-American—poorer control
Age	Older age—poorer control
Gender	No difference
Psychological factors	
Perceived risk of hypertension	Low perceived—poorer control
Motivation	Low motivation—poorer control
Avoidance coping style	High avoidance—poorer control
Memory	Memory difficulties—poorer control
Health-related literacy	Health-related illiteracy—poorer control
Perceived side effects of medication	High side effects—poorer control
Depression	High depressive symptoms—poorer control
Social/Cultural Environment	
Social economic status	Low SES—poorer control
Trust in medical care system	Lack of trust—poorer control
Social support/social network	Lack social network/social support—poorer control
Medical Environment	
Access to care	Lack of access—poorer control
Healthcare provider-patient relationship	Inadequate relationship—poorer control

\* Although minority status (i.e., African-American, Hispanic) is generally related to lower BP control, race/ethnicity is a proxy for other social/cultural and medical factors.

† BP, blood pressure; SES, socioeconomic status.

a model describing potential antecedents of blood pressure control (see Table 2 for summary of antecedents). These antecedents may include patients' psychological/behavioral characteristics, such as perceived risk of hypertension, avoidance coping, and poor memory; patients' medical care environment, such as problems of access to health care and insurance, and; patients' social/cultural environment.

Although it is clear that hypertension is a greater burden on minorities, particularly African Americans, further research needs to be conducted to examine how sociocultural factors may be considered and incorporated into successful interventions. Technological advances provide health care providers a key role in identifying and working with the patient who may lack BP control. In addition, incorporating the patients' social and medical environment as well as the role of the physician into the patients' treatment regimen will enable us to

achieve and perhaps surpass the national health objectives for the year 2010—to increase the proportion of patients with controlled BP to at least 50%.<sup>115</sup>

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