Short Form (SF-36) Health Survey Measures Are Associated With Decreased Adherence Among Urban African Americans With Severe, Poorly Controlled Hypertension

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The objective of this study was to determine whether an association exists between Short Form (SF-36) Health Survey measures and nonadherence among urban African Americans with poorly controlled hypertension. A total of 158 African Americans were admitted to an urban academic hospital for severe, uncontrolled hypertension. The main outcome measure was self-reported nonadherence to antihypertensive medications using a validated instrument. For every 10-point increase in Physical Component Summary (PCS) score, an individual was almost two times more likely to report being nonadherent (odds ratio, 1.94; 95% confidence interval, 1.30–2.90; $P<.01$). A significant interaction (P=.05) was observed between the physical functioning and mental health subscales. Individuals with high physical functioning and low mental health scores displayed the lowest adherence rate. These results suggest that high physical functioning, especially if associated with poor mental health, increases the likelihood of nonadherence to antihypertensive regimens among urban African Americans. The SF-36 may serve as an effective clinical tool that identifies patients at risk for nonadherence and, more importantly, may improve clinicians' understanding of nonadherence, allowing for discussions about antihypertensive medications to be tailored to individual patients. *J Clin Hypertens (Greenwich).* 2011;13:385–390. ©2010 Wiley Periodicals, Inc.

Hypertension is a major risk factor for stroke, heart disease, and kidney failure.[1,2] Blood pressure (BP) control decreases this risk.[3,4] Despite increasing rates of hypertension awareness and treatment, BP is controlled in only half of US residents with hypertension.[5] Nonadherence to treatment contributes to this poor control. Adherent patients are 3.44 times more likely to demonstrate good BP control when compared with nonadherent patients.[6] Yet adherence to antihypertensive medications is generally low, estimated to be between 50% and 70% nationally.[7,8]

A patient's perceived health status can impact adherence.[9,10] Patients who feel physically and/or emotionally well may be less inclined to take medications, especially in an asymptomatic condition such as hypertension. Furthermore, the impact of perceived good health on adherence may be greater in urban environments where there are substantial social and structural barriers to adherence. In support of this notion, Cummings and colleagues[11] found that the most common reason for discontinuing BP treatment in a sample of urban African Americans was "feeling fine without the medicine." A meta-analysis lends further support to the relationship between health status and adherence.[12] Among persons with less acute conditions such as hypertension, health status as rated by a physician or objective criteria was associated with adherence. However, in the same meta-analysis, *self-rated* health status was not associated with adherence, suggesting that previously studied measures of self-rated health status may be inadequate.[12]

This paper proposes the use of the Short Form (SF-36) Health Survey as a more accurate measure of perceived health status. The SF-36 is a widely used instrument that assesses an individual's perceived physical and mental health and could serve as a clinical tool that identifies patients at risk for nonadherence as well as enhances clinicians' understanding of nonadherence. To our knowledge, however, scores from the SF-36 have yet to be used as predictors of nonadherence among patients with hypertension. Therefore, we explored the relationship between perceived health status, as measured with the SF-36, and nonadherence among urban African Americans with poorly controlled hypertension. We further examined this relationship in light of several relevant covariates that could modify the impact of perceived health status on adherence.

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METHODS

Design

We analyzed baseline cross-sectional survey data from cases in the Inner City Hypertension and Body Organ Damage (ICHABOD) study, a case-control study of severe, uncontrolled hypertension of hospitalized urban African Americans. This project was reviewed and approved by the Johns Hopkins Medicine institutional review board.

Setting, Population, and Sampling

We screened BPs of every patient admitted to medicine units at an urban academic medical center in Baltimore, MD, during the periods of August 1999 to June 2001 and February 2002 to December 2004. Severe, uncontrolled hypertension was defined as systolic BP $\geq$180 mm Hg and diastolic BP $\geq$110 mm Hg measured on two separate occasions in the emergency department. Elevation of both systolic and diastolic BP was required in order to limit recruitment of persons with isolated systolic hypertension. Automatic oscillatory devices were used to measure BPs. Exclusion criteria included the following: hypertension secondary to a known cause, age younger than 18 years, residence outside of Baltimore, and race/ethnicity other than African American.

During the course of the study, 485 individuals were admitted with BPs >180/110 mm Hg. Of these individuals, 192 (40%) were excluded from the study because they either had an identifiable cause of elevated BP or were unable to give consent. Seven percent of eligible participants died in the hospital before being enrolled in the study. Of the remaining 272 living and eligible individuals, 193 completed the study (71% response rate). Hypertension was a new diagnosis in 8 patients and 26 patients did not complete the SF-36 Health Survey, giving a final dataset of 158 participants.

Instrument

We used a structured questionnaire made up of items adapted from previous instruments[13,14] to assess the following: medical history, health habits, social background, access to care, medications, adherence, health status (SF-36 Health Survey), and history of addiction. This instrument was field tested with a convenience sample of 10 community patients with hypertension to ensure readability, clarity, and cultural appropriateness of content. We also performed a chart review to assess comorbidities.

Dependent Variable: Nonadherence to Medication

To assess the role that nonadherence played in precipitating hospital admission, we developed a single question that could efficiently ascertain adherence behavior among patients admitted to the hospital.[15] Our specific goal was to develop a brief, easily administered assessment of adherence behavior in a busy hospital setting. Therefore, we asked: "Had you missed taking your BP pills before you came into the hospital?" To objectively validate the accuracy of our single-item self-reported measure of adherence, we tested how well the item performed in 26 persons with hypertension using urine high-performance liquid chromatography (HPLC). Results of this analysis, reported previously, revealed that our question was 90% sensitive and 87.5% specific for adherence.[15] This analysis suggests that the single-item adherence measure used in the current study accurately classified participants' adherence levels prior to hospitalization.

Independent Variable: Health Status (SF-36 Health Survey)

The SF-36 Health Survey is a widely used measure of health-related quality of life (HRQOL).[16,17] Of the 8 SF-36 subscales, the physical functioning and role physical scales are most closely related to physical health. These scales assess the degree to which an individual's physical health limits his or her daily and work activities. In addition, the 8 subscales are used to generate the Physical Component Summary (PCS) and Mental Component Summary (MCS), two summary scores intended to assess the physical and mental dimensions of health.[17] Both the scale and summary scores are arranged in such a way that high scores indicate higher levels of perceived HRQOL. Also, the more concise PCS and MCS measures have been standardized to the general US population (mean, 50; standard deviation [SD], 10), allowing for scores from any one group to be easily compared with US population norms. The scoring of SF-36 scales and calculation of summary scores followed instructions provided by Ware and colleagues.[16,17]

Covariates of Adherence

We asked several questions designed to assess the following covariates known to affect adherence behavior: comorbidities, education, employment, ability to pay for medications (eg, insurance, income), and substance use.

Data Collection and Management

Research assistants trained to pose (and if necessary clarify) study questions administered the instrument face-to-face in a standardized manner. They implemented the questionnaire in a nonjudgmental fashion to optimize participant disclosure of adherence and other lifestyle behaviors. Research assistants stressed that a doctor would not be informed of their answers and that their responses were confidential. Responses from all interviews were double-entered into a secure electronic database and checked with the original interview record to resolve any inconsistencies.

Analysis

We first examined the baseline characteristics of our study population. We then examined the associations

of SF-36 summary scores with nonadherence using logistic regression. We constructed multivariate models to adjust for age, sex, ability to pay, and "problems with medications," which includes the experience of side effects, the perception of taking too many pills, or the belief that the medications are not effective. Following this, we looked for associations between adherence and health status as measured by individual SF-36 subscales and nonadherence. To do this, we created a multivariate model that included each of the 8 subscales. In addition, we used a unique variance approach to establish each subscale's contribution to the variance in our population's adherence behavior. Finally, we tested for an interaction between the physical functioning and mental health subscales given their observed associations with adherence. Individuals were defined as having high levels of physical functioning or mental health if they scored above the median score for each variable.

RESULTS

Baseline characteristics for the 158 participants in whom we had complete nonadherence and SF-36 data are shown in Table I. Of these individuals, 111 (70%) reported missing their medications prior to coming into the hospital. The study population's PCS score (mean, 34.6; SD, 10) and MCS score (mean, 46.9; SD, 10) were below those of the general US population (mean, 50; SD, 10 for both PCS and MCS).[16,17] Participants who did not complete the SF-36 were similar to those who did with regard to age, education, income, employment, substance use, comorbidities, presence of nonadherence, and most reasons for nonadherence. Among those who did not complete the SF-36, a greater proportion tended to be men (P=.06) and to have experienced medication side effects (P=.01).

TABLE I. Baseline Characteristics Among 158 Persons with Severe, Poorly Controlled Hypertension

	Total (N=158)
Demographics	
Age, y	51±12
Female, %	58
Finished high school/GED, %	55
Currently employed, %	32
Monthly income, $	872
Disease characteristics	
Mean SBP, mm Hg	201±18
Mean DBP, mm Hg	123±14
Comorbidities (≥1), %[a]	62
No. of admissions (past 5 y)	4.0
Substance abuse, %	
Current smoking	53
Current cocaine	18
Current heroin	17
Heavy alcohol use	10
Adherence, %	
Nonadherence	70
SF-36 summary score	
PCS, mean	34.6
MCS, mean	46.9

Abbreviations: DBP, diastolic blood pressure; MCS, Mental Component Summary; PCS, Physical Component Summary; SBP, systolic blood pressure; SF-36, Short-Form Health Survey.
[a]Comorbidities included coronary artery disease, end-stage renal disease, congestive heart failure, or cerebral vascular disease.

Associations of SF-36 Summary Scores With Nonadherence: Multivariate Models

PCS score showed a significant association with nonadherence. When adjusted for age and sex, for every one SD (10-point) increase in PCS score, an individual was close to 2 times more likely to report being nonadherent (odds ratio [OR], 1.94; 95% confidence interval [CI], 1.30–2.90; P<.01) (Table II). PCS remained significant after adjustment for variables known to contribute to nonadherence (Table II). In contrast to the PCS summary score, the MCS summary score was not shown to be associated with nonadherence in any of the multivariate models (Table II).

Associations of SF-36 Subscales With Nonadherence

After establishing an association between PCS and nonadherence, further analysis investigated which SF-36 subscales most contributed to nonadherence behavior (Table III). For every SD (10-point) increase in physical functioning, an individual was more than 1.5 times more likely to report being nonadherent (OR, 1.61; 95% CI, 1.04–2.48; P=.03). Of note, high scores on the mental health subscale showed a trend toward an association with adherence behavior (OR, 0.67; 95% CI, 0.39–1.16; P=.16). A unique variance approach revealed that the physical functioning and mental health subscales had the greatest contributions to the total variance in reported nonadherence (Table III).

Physical Functioning and Mental Health: A Test for Interaction

Further analyses tested for an interaction between the physical functioning and mental health subscales (Table IV). A significant interaction (P=.05) was observed between these two variables. Specifically, individuals with high physical functioning and low mental health scores displayed the lowest rate of adherence (16%).

DISCUSSION

We used the SF-36 Health Survey to measure health status among urban African Americans with poorly controlled hypertension and found a strong association between high perceived physical health and nonadherence. This association was independent of other factors known to influence adherence behavior. The capacity of the physical health component of the

TABLE II. Multivariate Models Demonstrating the Association of Health Perception With Nonadherence Among 158 Persons With Severe, Poorly Controlled Hypertension[a]

SF-36 Summary Score	Model 1[b] OR (95% CI)	Model 2[c] OR (95% CI)	Model 3[d] OR (95% CI)	Model 4[e] OR (95% CI)
PCS	1.92 (1.29–2.86)	1.94 (1.30–2.90)	1.97 (1.32–2.95)	1.81 (1.20–2.74)
MCS	0.95 (0.69–1.39)	1.01 (0.70–1.46)	1.03 (0.71–1.50)	1.08 (0.73–1.61)

Abbreviations: CI, confidence interval; MCS, Mental Component Summary; OR, odds ratio; PCS, Physical Component Summary. [a]Short-Form (SF-36) Health Survey summary scores in units of 1 standard deviation. [b]Model 1: unadjusted association of SF-36 and nonadherence. [c]Model 2: association of SF-36 and nonadherence adjusted for age and sex. [d]Model 3: association of SF-36 and nonadherence adjusted for age, sex, and problems with medications (perception of side effects, taking too many pills, or ineffectiveness). [e]Model 4: association of SF-36 and nonadherence adjusted for age, sex, problems with medications, and ability to pay for medications.

TABLE III. Association Between Each SF-36 Subscale and Nonadherence When All Subscales Are Included in the Same Multivariate Model[a]

SF-36 Subscale	OR (CI)	*P* Value	Log-Rank χ^2 Subtracted Variable
Physical functioning	1.61 (1.04–2.48)	.03	4.89
Role-physical	1.13 (0.70–1.81)	.62	0.26
Bodily pain	1.19 (0.77–1.85)	.44	0.60
General health	1.11 (0.69–1.79)	.66	0.20
Vitality	1.14 (0.66–1.98)	.63	0.24
Social functioning	1.04 (0.61–1.76)	.90	0.02
Role-emotional	1.04 (0.66–1.60)	.87	0.03
Mental health	0.67 (0.39–1.16)	.16	2.08

Abbreviations: CI, confidence interval; OR, odds ratio. [a]Short-Form (SF-36) Health Survey subscales and summary scores in units of 1 standard deviation. [b]Partitioning the variance in adherence due to SF-36 components. The 8-variable model contains all 8 SF-36 subscores (log-rank χ^2 8 variable model) and the 7-variable model is the same model without the subtracted variable.

TABLE IV. Prevalence of Adherence by Levels of Physical Functioning and Mental Health

	Mental Health		
Physical Functioning	High[a]	Low	
High	27% (43)	16% (26)	44% (69)
Low	26% (41)	30% (48)	56% (89)
	53% (84)	46% (74)	100% (158)

[a]High level is defined as being above the median score for each variable.

SF-36 to identify persons at risk for nonadherence may further enhance the impact of quality of life assessment on interventions designed to increase adherence to antihypertensive medications.

Although there was no association observed between MCS and nonadherence, the contribution of the mental health subscale to the variance of adherence behavior was second only to the physical functioning subscale in models including all subscales. Past studies have associated depression with increased nonadherence.[18–20] Indeed, high scores on the mental health subscale showed a trend toward decreased nonadherence in our study. Further analysis revealed an interaction between the two subscales. Individuals with low mental health scores and high physical functioning displayed the lowest adherence rate, while those with physical functioning scores below the median displayed the highest adherence rate. These findings suggest that patients who have a low level of perceived mental health but a high level of physical functioning may not choose to take medication for an asymptomatic illness, especially in a low-resource setting.

It is important to explore why increased perceived physical health is associated with nonadherence. Ogedegbe and colleagues[9] describe how beliefs can serve as patient-specific barriers to adherence. More specifically, the asymptomatic nature of hypertension conflicts with two commonly held health beliefs. First, as Lukoschek explains, many populations believe signs and symptoms to be a "necessary principle of disease."[21] In his study, this belief appears to threaten adherence as many nonadherent individuals reported disbelieving their diagnosis of hypertension because they lacked symptoms.[21] Second, some patients with hypertension believe that medications are not needed when one is not experiencing symptoms.[9] In fact, studies report that individuals who take antihypertensives adjust medication taking depending on the presence of symptoms and/or impairment of daily functioning.[21–24] Similarly, past experience of disease, such as a history of myocardial infarction or stroke, is associated with increased adherence to antihypertensives.[25] Thus, these two health beliefs recognize the importance of symptoms as indicators of disease and triggers for medication taking.

Therefore, as suggested by our study, if an individual is feeling well, there may be no symptoms present to remind him or her of disease and the need for treatment. Furthermore, without symptoms as a gauge of medication effectiveness, high-functioning individuals may be more likely to doubt the worth of taking medications and less likely to tolerate side effects. In short, adherence can be conceptualized as the product of a decision-making process[23]; however, without symptoms or physical impairment, the "decision" to take antihypertensives may not even arise and/or taking medications may not be seen as worthwhile.

To think about perceived physical health only in its relation to health beliefs would be oversimplifying its impact on adherence. Adherence behavior is more than the result of being aware of one's disease and knowledgeable of the importance of treatment. Adherence may also involve tradeoffs with competing priorities.[23] Many urban African Americans deal with a number of chronic stressors that make it difficult to adhere to antihypertensive treatment, including limited financial resources, limited access to care, caring for dependents, unemployment/minimal job benefits, exposure to violence, racial discrimination, and active addiction.[9,21,22,26–30] In some cases, chronic stressors and barriers such as these may be preventing the decision to adhere to medications from coming to one's conscious attention on a daily basis. In other cases, the decision to adhere may be recognized; however, individuals with high perceived physical health may consider their health status sufficiently stable enough to turn their attention to other more immediate priorities. Thus, barriers to care and chronic stressors may be making it more difficult for a high-functioning individual to prioritize his or her health care. Future interventions aimed at improving adherence must account for these competing priorities in addition to medication-specific barriers. Such an approach recognizes that adherence behavior truly reflects the sum of cognitive, affective, and contextual influences.

Limitations

Reliance on self-report as an assessment of nonadherence is the primary limitation of this study. We did, however, specifically phrase our measure of nonadherence to minimize social desirability bias. Second, recall bias could have affected self-reports of nonadherence. Third, our findings may be difficult to generalize because the inner-city Baltimore population has distinct cultural origins and encounters distinct socioeconomic stressors that may not be present among other urban African Americans. Finally, the cross-sectional nature of this study prevents causal inferences from being formed. Therefore, these associations warrant further research.

CONCLUSIONS

This study identified high perceived physical health, accompanied by low perceived mental health, as a risk factor for nonadherence among urban African Americans. This association may be due to beliefs about disease and treatment. It also could be the result of socioeconomic stressors that make it difficult to prioritize treatment of a disease that does not impair physical functioning. These findings suggest that adherence could be improved with interventions tailored to individuals with high physical functioning in low-resource environments.

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