

UNDERSTANDING THE COMPLEXITY OF HYPERTENSIVE AFRICAN AMERICAN HOME CARE PATIENTS: CHALLENGES TO INTERVENTION

Objective: To examine sociodemographic, clinical, and self-management characteristics of a sample of urban, African American patients admitted to home health care with uncontrolled hypertension and to determine the extent to which these factors are associated with disease severity.

Methods: We conducted a cross-sectional study of 498 hypertensive African American patients newly admitted to home health care. Data for this study were drawn from patient-level clinical and functional assessment data derived from the uniform home health assessment system mandated by the Centers for Medicare and Medicaid Services and patient in-home interviews.

Results: Forty percent of patients had stage 1 hypertension, and 60% had the more severe uncontrolled stage 2. Multivariate analyses found that factors associated with stage 2 were co-morbid diabetes, poor appointment keeping, low activation, and longer time since diagnosis. Protective factors associated with a lower likelihood of severe uncontrolled hypertension were older age and recent discharge from a hospital. More co-morbid conditions also appeared to be protective, although the association did not reach significance.

Conclusions: Our findings highlight the need to address hypertension control among the African American, dually diagnosed diabetic hypertensive population and underscore the critical role of treatment adherence, widely recognized as a key issue in managing hypertension and other chronic conditions. Successful strategies will likely require more aggressive action by home health nurses, both to alert patients' primary care providers to ongoing, unsuccessfully treated hypertension and to remediate patients' inadequate self-

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INTRODUCTION

African Americans have disproportionately high rates of hypertension and poorer outcomes compared with their White counterparts. An estimated 1 in 4 US adults has hypertension, while the prevalence among non-Hispanic Blacks is more than 1 in 3.¹ African Americans experience significantly higher rates of hypertension-related nephropathy, stroke, heart failure, type 2 diabetes, and end-stage renal disease.² Moreover, the death rate per 100,000 people from high blood pressure is more than twice as high for Blacks (40.9 for Black women and 51.0 for Black men in 2004) as for the population as a whole (18.1 in 2004).³

Data from randomized controlled trials, however, indicate that African Americans who are prescribed and adhere to appropriate medication and dietary regimens achieve blood pressure control,^{4,5} a finding that rules out biological differences as an explanation for disparate racial outcomes. This finding implies that African Americans are more likely to encounter obstacles to accessing appropriate hypertension care, as has been found in other investigations of health service use in the United States.^{6,7} Another implication is that efforts to address patient knowledge, self-management, and barriers to hypertension management can increase rates of blood pressure control among African Americans, as well as the hypertensive population in general. Data from the National Health and Nutrition

Examination Survey indicate that while approximately three-quarters of African Americans with hypertension are aware of their diagnosis, only 57% receive hypertension treatment, and only approximately one-quarter have their blood pressure under control.⁸

The purpose of this study was to examine sociodemographic, clinical, and self-management characteristics of a sample of urban, African American patients admitted to home health care with uncontrolled hypertension and to determine the extent to which these factors are associated with disease severity. Prospective studies have demonstrated repeatedly that progressively higher levels of blood pressure lead to progressively increased risk of cardiovascular disease, stroke, and renal insufficiency.^{9,10} A metaanalysis of >1 million people indicated that for every 20 mm Hg systolic blood pressure (SBP) or 10 mm Hg diastolic blood pressure (DBP) increase, the death rate from both ischemic heart disease and stroke doubles.^{11,12} In this study, we focus on people with severe hypertension, a group that should receive heightened attention to reduce the potential for serious consequences.

METHODS

Study Sample

We evaluated a sample of consecutive, prospectively identified adult African American patients with uncontrolled hypertension who were newly admitted to a large, Medicare-certified, non-profit, urban home health agency from February 2006 through August 2007. Hypertension status was determined by a primary, secondary, or tertiary diagnosis of hypertension (In-

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ternational Classification of Diseases, Ninth Revision, Clinical Modification codes 401, 402, 403, or 404) in the home care record and SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg ($\geq 130/80$ for patients with diabetes or chronic kidney disease). Trained field interviewers took patients' blood pressures in their home by using a Microlife Model 3AA1-2 (Microlife USA, Inc, Dunedin, Florida), a device that uses an oscillometric algorithm validated by the British Hypertension Society. The average of 3 readings was used to determine study eligibility. We excluded patients with cognitive impairment, severe heart failure, end-stage renal disease, life expectancy < 6 months and those who had had a kidney transplant or were on dialysis. The study was approved by the appropriate institutional review boards.

Data Sources and Study Measures

Data were drawn from the uniform home health assessment system mandated by the Centers for Medicare and Medicaid Services and structured, in-home patient interviews. Information on age, sex, insurance status, health status (pre-existing medical conditions), cognitive status, and function (limitations in activities of daily living) was derived from the nurse's routine assessment conducted during the initial visit. Most other information came from the patient interviews conducted by trained research staff.

The patient interview elicited detailed information on patient's blood pressure, hypertension knowledge and self-management preparedness, and adherence to hypertension care, including medications and dietary restrictions. Whenever possible, we employed standardized concepts and measures. The Hill-Bone compliance to high blood pressure therapy scale was used to measure hypertension-related health behaviors. This 14-item scale poses questions in 3 domains: sodium intake, appointment keeping, and medication

taking; each item is answered on a 4-point Likert-type scale.¹³ General self-management preparedness was measured by using the patient activation measure (PAM), which assesses a person's self-reported knowledge, skills, and confidence for self-management of his health care.¹⁴ Questions about medication adherence barriers were drawn from the Brief Medication Questionnaire (BMQ).¹⁵ Co-morbid conditions were collected by using the Charlson co-morbidity index, self-report version, a 10-item validated scale that includes information on formal diagnosis of asthma, emphysema, chronic bronchitis, arthritis or rheumatism, cancer diagnosed in the last 3 years, diabetes, digestive problems, heart trouble, HIV infection, kidney disease, liver problems, and stroke.¹⁶ Depressive symptoms were assessed by using the 15-item geriatric depression scale (GDS).¹⁷ Height and weight were collected to calculate body mass index (BMI).

On the basis of blood pressure readings taken at the in-home interview as described above, patients were classified according to disease severity stages defined in the seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, with additional adjustment for lower blood pressure recommendations for people with diabetes. Specifically, patients were categorized as stage 1 if their average in-home blood pressure reading was 140-159/90-99 mm Hg (130-149/80-89 mm Hg for people with diabetes or chronic kidney disease) and stage 2, or severe, uncontrolled hypertension, if their average in-home blood pressure reading was $\geq 160/100$ mm Hg ($\geq 150/90$ mm Hg for people with diabetes or chronic kidney disease).

Statistical Analysis

Multivariate logistic regression models were used to examine the independent effects of sociodemographic,

economic, and clinical characteristics on the likelihood of having severe, uncontrolled (stage 2) hypertension. Sociodemographic characteristics included age, sex, educational level, primary source of payment for the home health stay, borough of residence, and usual source of care (private office vs any other settings). Clinical characteristics included obesity (BMI > 29 kg/m²), co-morbid conditions, history of hospitalization, months since hypertension diagnosis (and its square to control for nonlinearities), and evidence of depressive symptoms (GDS > 9). In addition to models with this core set of variables, additional analyses were performed to test the independent effect of self-management and adherence behaviors on the probability of severe, uncontrolled hypertension. Because including these potentially endogenous variables did not materially affect the core variables' results, they were retained in the final model.

We tested the sensitivity of our findings by examining several variants of the model. In some versions, we reclassified hypertension severity among people with diabetes by using the same threshold for people without diabetes. In others, we included interaction terms between certain characteristics of interest (eg, age and a diagnosis of diabetes, age and time since hypertension diagnosis) or considered additional regressors, such as income and specific barriers to adherence (eg, ability to pay, medication side effects, difficulty remembering medication doses). Our findings were robust to these alternative specifications, none of which yielded an improved model fit.

RESULTS

In total, 498 adult African American patients with uncontrolled hypertension were admitted to home health care during the study period and participated in the interviews (Table 1). Two-thirds

Table 1. Sociodemographic and clinical characteristics of 498 African American patients admitted to home health care with uncontrolled hypertension from February 2006 through August 2007

Characteristic	Mean (SD) or n (%)*
Female, n (%)	342 (68.7)
Mean age (SD), years	64.6 (10.8)
Age category, n (%)	
<45 years	21 (4.2)
45–64 years	201 (40.4)
65–74 years	167 (33.5)
75–79 years	109 (22.0)
Educational level, n (%)	
Less than high school graduate	202 (40.8)
High school graduate or higher	296 (59.2)
Income, n (%)*	
<\$10,000	223 (52.4)
\$10,000–\$29,999	146 (34.3)
≥\$30,000	57 (13.4)
Primary home health payer, n (%)	
Medicaid only or dually eligible	213 (42.8)
Medicare only	179 (35.9)
Private insurance	59 (11.8)
Other	47 (9.4)
Usual source of care, n (%)	
Clinic	241 (48.4)
Private doctor's office	229 (46.0)
Other/no usual source of care	28 (5.6)
Blood pressure, mean (SD) SBP/mean (SD) DBP	
Full sample	157.9 (21.4)/87.7 (14.9)
Stage 1 subsample	140.5 (8.6)/79.6 (10.0)
Stage 1, n (%)	199 (40)
Stage 2 subsample†	169.4 (15.2)/93.1 (15.2)
Stage 2, n (%)	299 (60)
Mean (SD) months since hypertension diagnosis	169.1 (149.9)
Mean (SD) number of additional co-morbidities	2.1 (1.3)
Diabetes, n (%)	300 (60.2)
Hospitalized within 14 days of admission to home care, n (%)	330 (66.3)
Mean (SD) BMI, kg/m ²	30.9 (8.3)
Underweight, n (%)	10 (2.1)
Healthy weight, n (%)	112 (23.8)
Overweight, n (%)	135 (28.7)
Obese, n (%)	213 (45.3)
Depressive symptoms, n (%)	
Normal	298 (59.8)
Mild depression	162 (32.5)
Moderate/severe depression	38 (7.6)

SD = standard deviation, SBP = systolic blood pressure, DBP = diastolic blood pressure, BMI = body mass index.

* Information missing for 14.5%; denominator used to calculate percentages was 426.

† Stage 2 hypertension is defined as blood pressure ≥160/100 mm Hg (≥150/90 mm Hg for people with diabetes or kidney failure).

of the patients were hospitalized in the 14 days before home care admission: 9.4% were referred from another institutional setting (eg, nursing home, rehabilitation center) and 24.3% were referred by a community physician. On average, these patients had been diagnosed with hypertension for 14 years. In addition to hypertension, they had 2 other chronic

conditions, most commonly diabetes (60.2%), arthritis or rheumatism (50.6%), or heart disease (27.0%). One out of 5 patients had a history of stroke. On average, patients were taking almost 6 prescribed medications, including 2 medications for hypertension. Nearly half were obese, and an additional 28.7% were overweight. The sample's character-

istics according to self-management behaviors and self-management readiness are described in Table 2.

After controlling for potential confounders, the probability of having severe, uncontrolled stage 2 hypertension was significantly higher among persons with diabetes, those with poor appointment keeping, and those in the lowest patient activation category. Longer time since diagnosis also increased the likelihood of severe, uncontrolled hypertension. However, the relationship between time since diagnosis and severe, uncontrolled hypertension exhibited a convex shape (ie, the probability of severe, uncontrolled hypertension increased with time since diagnosis up to an inflection point and decreased thereafter). Older patients and, to a lesser extent, those with more education and those admitted from a hospital were less likely to have severe, uncontrolled hypertension. Finally, patients with more comorbid conditions also were less likely to experience severe, uncontrolled hypertension, although the coefficient failed to reach significance. (Table 3)

DISCUSSION

Our findings highlight the need to address hypertension control among patients who also have diabetes. People with diabetes, who made up 60% of our overall sample of African Americans with uncontrolled hypertension and 71% of those with severe hypertension, were 3 times more likely than those without diabetes to have severe, uncontrolled hypertension. Recent evidence from clinical trials suggests that greater reductions in morbidity and mortality may result from intensive control of blood pressure in older people with type 2 diabetes than may result from tight glycemic control.¹⁸ In home care as in the primary care setting, however, preoccupation with managing diabetes-specific treatment may overwhelm both clinicians and patients and divert attention from the need to address other serious conditions.¹⁹

Table 2. Self-management behaviors and barriers to adherence among 498 African American patients admitted to home health care with uncontrolled hypertension from February 2006 through August 2007

Variable	Mean (SD) or n (%)
Mean (SD) Hill-Bone compliance to high blood pressure therapy scale score*	18.4 (3.3)
Medication adherence subscale (range 8–24)	9.4 (2.0)
Sodium intake subscale (range 3–12)	4.5 (1.4)
Appointment keeping subscale (range 3–12)	4.5 (1.5)
Currently smokes cigarettes, n (%)	100 (20.1)
Mean (SD) patient activation measure	58.5 (14.9)
Stage 1 (least activated), n (%)	107 (21.5)
Stage 2, n (%)	72 (14.5)
Stage 3, n (%)	202 (40.6)
Stage 4 (most activated), n (%)	117 (23.5)
Selected Brief Medication Questionnaire (BMQ) barriers	
Medication causes side effects, n (%)	
Not at all	329 (69.4)
Somewhat/a lot	145 (30.6)
It is hard to pay for meds, n (%)	
Not at all	330 (68.9)
Somewhat/a lot	149 (31.1)
It is hard to remember doses, n (%)	
Not at all	394 (82.3)
Somewhat/a lot	85 (17.7)

SD = standard deviation.

* Higher scores indicate poorer adherence.

Table 3. Factors associated with severe uncontrolled hypertension among 498 African American patients admitted to home health care with uncontrolled hypertension from February 2006 through August 2007*

Characteristic	Odds Ratio (P Value)	95% Confidence Interval
Female sex	.84 (.46)	.52–1.35
Age, years (mean, sd)	.97 (.04)	.94–1.00
Educational Level: High school graduate or more	.68 (.09)	.43–1.05
Insurance status: Medicaid or dually eligible	1.16 (.51)	.74–1.82
Usual source of care: MD office	1.18 (.45)	.77–1.83
Clinical Characteristics		
Months since hypertension diagnosis	1.01 (.02)	1.01–1.01
Months since diagnosis squared	1.00 (.01)	.99–1.01
Number of additional co-morbidities	.94 (.11)	.86–1.02
Diabetes	3.19 (<.01)	2.02–5.03
Hospitalized within 14 days of admission to home care	.68 (.10)	.43–1.07
BMI: Obese:	.81 (.34)	.52–1.25
Moderate/severe Depressive Symptoms	1.19 (.45)	.75–1.88
Barriers to Adherence		
Patient Activation Measure (PAM): Stage 1	1.80 (.04)	1.01–3.19
Hill Bone Compliance Scale		
Medication Adherence	.94 (.48)	.80–1.11
Sodium Intake	.92 (.26)	.79–1.06
Appointment Keeping	1.15 (.02)	1.01–1.29

* All analyses also control for county of residence.

Our findings also underscore the critical role of treatment adherence, which has been widely recognized as a key issue in managing hypertension and other chronic conditions.^{20,21} People with these conditions often must follow complex medication and diet regimens, monitor their own health status, alter their lifestyles, and effectively interact with various healthcare providers.²² Multiple factors influence treatment adherence, including demographic and clinical factors, medication complexity and side effects, health beliefs, and health system issues.^{23–27} Our study provides information on a less well-studied phenomenon by using PAM, which measures general self-management preparedness.¹⁴ Our multivariate results show that patients at the lowest PAM level (stage 1) were 80% more likely to have severe, uncontrolled hypertension than were patients who were at the 3 higher levels of awareness, knowledge, and confidence in their ability to manage their chronic conditions. Independent of PAM stage, our multivariate analysis also found that poorer adherence to appointment keeping, as measured by higher scores in the relevant Hill-Bone subscale, was significantly associated with severe, uncontrolled hypertension.

Our analysis also identified several protective factors associated with a lower likelihood of severe, uncontrolled hypertension. Consistent with other studies,^{1,28} higher education was associated with better blood pressure control. We also found older age to be protective, in contrast to most national studies, which have found younger rather than older age to exert a protective influence.^{29,30} Our finding may reflect in part the fact that we controlled for patient activation level, which declines with age,¹⁴ while to our knowledge no other published hypertension studies have introduced a comparable control for self-management preparedness. Our findings suggest that once the effects of patient activation, combined with other clinical and behavioral factors, are separated from age,

other circumstances of older age may lead to better blood pressure control.

Finally, admission to home care from the hospital (compared with referral by a community physician) yielded a 30% lower probability of severe, uncontrolled hypertension, while each additional co-morbidity also had a protective influence. The prior hospitalization result suggests that hypertension may receive more concentrated attention in the hospital setting than in the community, where physicians frequently have been cited for "inertia" with respect to treatment of high blood pressure.^{31,32} The co-morbidity result is consistent with several recent studies that found multi-morbidity to be associated with better quality of care.^{33,34} This relationship, in turn, seems partly due to greater frequency of physician visits and higher rates of specialty care among people with multiple chronic conditions.³³

Surprisingly, patients in our study with blood pressure at differing stages of severity did not differ with respect to a number of factors that conventional wisdom would tell us matter in determining the likelihood of better-controlled hypertension. Contrary to findings in another study that urgent and emergent hypertension, among a sample of inner-city, minority emergency department patients, were more common among patients who had no primary care physician,²³ we found that having a physician's office (as opposed to clinic or other setting) as a usual source of care did not reduce the likelihood of severe, uncontrolled hypertension. Our finding may reflect the fact that we controlled for appointment keeping. Clinical and behavioral risk factors such as obesity and smoking also were not significantly associated with severe uncontrolled hypertension in our sample, even when other potentially collinear variables, such as adherence behaviors and PAM score, were eliminated from the regression. Our study sample is more homogenous than most—entirely African American and disproportionately urban,

female, elderly, diabetic, and having multiple co-morbid conditions. These risk factors may overpower obesity and smoking as predictors of hypertension severity in this population. Another potential consideration is that risky behaviors such as obesity and smoking may be more powerful predictors of any hypertension than of severe hypertension among a population such as ours, all of whom have uncontrolled blood pressure.

This study is not without limitations. It relies on self-reported measures of adherence and on cross-sectional data that suggest, but cannot prove, causality. Further, our study focuses on African American patients served by a single urban home health organization that provides care to a low-socioeconomic status population that is more likely to be dually eligible for Medicare and Medicaid than is the typical home care population. Because we report on a patient sample specifically selected to target high blood pressure among African Americans, we cannot report comparable data on nonhypertensive African Americans or members of other racial/ethnic groups with or without uncontrolled hypertension. However, we believe that a strength of our study is its narrow focus on an undertreated, understudied population among whom high blood pressure has proven to be particularly intractable and damaging.

To our knowledge, this is the first study to target home healthcare patients, an especially complex, high-risk group characterized by prior hospitalization or referral by a community physician for skilled nursing care. Home health care represents a segment of the healthcare system where a substantial number of high-risk hypertension patients are served, where hypertension management likely requires improvement, and where nursing personnel are uniquely positioned to mobilize care management and patient-education skills to increase the proportion of treated hypertension patients who achieve adequate blood pressure control.

Yet our results highlight the challenges ahead for home care agencies seeking more aggressive, effective strategies for treating African American patients with uncontrolled hypertension. Our sample was marked by low education, low income, heavy reliance on clinics for primary care, high likelihood of obesity and multiple comorbidities, taking almost six prescribed medications – all factors complicating medical and behavioral regimens, treatment adherence and interactions with the health care system. Subjects had on average a 14-year history of grappling with hypertension, while six in ten patients had severe, uncontrolled Stage 2 hypertension. Low education, long duration of hypertension, and diabetes were especially pronounced among the latter group, indicating their heightened socio-economic and clinical vulnerability. Further, individuals in this group were handicapped with a very low level of patient activation, indicating lack of awareness, knowledge, skills or confidence in their ability to deal with this long-term life-threatening but silent condition.

Successful strategies will require more aggressive action on the part of home health nurses to alert both patients and patients' primary care physicians (PCPs) to the presence of ongoing, unsuccessfully treated hypertension – an action complicated by physicians' inertia and the fact that so many patients rely on clinics, including hospital outpatient clinics with a string of rotating residents. Linking "unconnected" patients to a "medical home" – a usual source of care where the PCP gets to know the needs of the hypertensive patient and assures that the patient is on the most effective hypertension medication regimen over time – may be essential to long-term BP control but will require broader systems reform than can be effected by most home care providers during the typical Medicare/Medicaid home care stay. In contrast, developing education and behavioral strategies designed to address varying levels of patient preparedness for self-care

management should be more doable within the current scope of home health care practice. With proper training and support for home care professionals and paraprofessionals, home care has the potential to achieve long-term impact by developing "activation-appropriate" strategies tailored to individual patients' knowledge and skills and designed to "break the cycle of failure" experienced by patients who are either unaware of or unable to adhere to the behavioral changes required to achieve effective control of their chronic conditions.³⁵

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