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Rosalind Peters

Ramona Benkert

Karyn Butler

Grand Valley State University, butlekar@gvsu.edu

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Provider Adherence to JNC 7 Guidelines and Blood Pressure Outcomes in African Americans

Rosalind M. Peters, PhD, RN, Ramona Benkert, PhD, APRN-BC, Karyn Butler, MS, CNM, and Nicole Brunelle, MSN

Abstract

- **Objective:** To measure provider adherence with the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) and assess whether adherence is associated with improved blood pressure (BP) control among low-income African-American patients.
- **Design:** Chart review.
- **Setting and participants:** A primary care clinic for low-income patients within an urban, university health center. Data were obtained from charts of 128 hypertensive African-American patients enrolled in a larger study.
- **Measures:** The Hypertension Quality Chart Review Index was used to measure adherence in the areas of cardiovascular risk assessment, lifestyle modification, pharmacologic treatment, and follow-up care. Patient BP was also recorded.
- **Results:** Overall provider adherence averaged 76%. Mean adherence scores were 85% for cardiovascular risk assessment, 57% for lifestyle intervention, 69% for pharmacologic treatment, and 80% for follow-up care. Adherence to follow-up care was significantly related to BP goal attainment ($r = 0.23$; $p < 0.05$). Mean BP values decreased but the changes were not significant. Nurse practitioners had higher total quality scores, while physicians achieved greater decreases in diastolic BP. There were no significant differences in BP goal attainment by provider type.
- **Conclusion:** Fairly high adherence with JNC 7 guidelines was noted, but it was not related to BP goal attainment. Lower adherence scores may reflect

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problems with documentation rather than practice. HTN and lowering blood pressure are well established and include decreases in cardiovascular disease, cardiovascular morbidity and mortality, and all-cause mortality [3]. Yet only 31% of hypertensive individuals have their blood

pressure controlled to less than 140/90 mm Hg, and barely half of patients actively treated for HTN have achieved recommended blood pressure goals [4]. Blood pressure outcomes are worse for African Americans, who have the highest prevalence of HTN and yet have lower rates of control, even with treatment, than non-Hispanic whites [4].

While these disparities are often attributed to patient factors such as increased prevalence of obesity and sedentary lifestyles, it is important that provider factors also be examined [5]. The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC) has a 30-year history of providing an evidence-based approach to the prevention and management of hypertension; however, there is scant literature describing provider adherence to JNC guidelines. A recent study [6] found that as many as 41% of physicians surveyed remained unaware or unfamiliar with JNC recommendations. Other studies have found variation in adherence, with rates ranging from 26% to 72% [7,8]. Most of the previous studies on adherence to guidelines have focused on pharmacologic treatment of HTN and failed to describe comorbidities or evaluate the multiple aspects of care as outlined in the JNC reports [7,9]. Only one study was found that evaluated all components of the JNC 6 guidelines [10], and none were found that examined the latest JNC 7 recommendations.

Few studies have evaluated adherence to JNC guidelines by primary care providers other than physicians. Three studies have assessed nurse practitioner care. They found that nurse practitioners were able to achieve blood pressure control rates greater than the 50th percentile based on HEDIS measures [11]; achieve significantly lower diastolic blood pressure than physicians [12]; and achieve similar outcomes in uninsured as insured patients [13]. The current review of the literature reveals that while hypertension guidelines are well established, there is little research on provider adherence to these national recommendations; limited research on care by nonphysician providers; scant information on the relationship of adherence to guidelines

From the Wayne State University College of Nursing and Karmanos Cancer Institute, Detroit, MI.

and hypertension outcomes among African Americans; and no studies could be found that evaluated the most current JNC 7 guidelines.

The purpose of this study was to determine if provider adherence to JNC 7 guidelines improved blood pressure control among a group of low-income African-American patients with hypertension. Specific aims were (1) to describe the levels of adherence to JNC 7 guidelines, (2) to determine the relationship between level of adherence and blood pressure goal attainment, and (3) to compare the level of adherence and outcome criteria by provider type.

Methods

Patient Sample

The sample consisted of a subset of patients who had been recruited to participate in a larger study examining the effect of organizational, interpersonal, and technical process variables on hypertension outcomes among African Americans [14]. Inclusion in the larger study required participants to be self-identified as African American, between 18 and 80 years of age with a documented diagnosis of hypertension (ICD-9 codes 401, 401.1, or 401.9), and a patient in the clinic for less than 18 months. A total of 145 participants were conveniently recruited from 2 primary care clinics located in a large urban university health center. This paper focuses on the 128 participants who received care in the joint-managed clinic. The joint-managed clinic serves indigent persons between 21 and 64 years of age who are eligible to participate in a county-funded capitated health insurance program. Strict income limits (\$500/month) are required for participation in the program, which includes prescription drug coverage. Care in the joint-managed clinic is provided by either nurse practitioners or physicians who are third-year internal medicine residents doing their primary care continuity rotation. The University Human Investigation Committee granted approval for the study.

Hypertension Quality Chart Review Index

To measure provider adherence with JNC 7 guidelines, we (RMP and RB) developed the Hypertension Quality Chart Review Index (HQI) (Figure). The index contains 4 subscales that correspond with the main areas addressed in the guideline: cardiovascular risk assessment, lifestyle modification, pharmacologic treatment, and follow-up care [3]. The instrument yields an overall score and 4 subscores reflecting adherence with the recommendations. A point is assigned if there is documentation that the guideline recommendation was followed. The Figure includes a description of how scores are calculated.

Cardiovascular risk assessment includes evaluation for obesity, diabetes, hyperlipidemia, and kidney function. The recording of laboratory values for these conditions was accepted as if done in the past year.

Lifestyle interventions were considered addressed if teaching related to diet, physical activity, smoking cessation (if smoker), alcohol reduction (if history of alcohol abuse or reported alcohol consumption beyond recommended limits), or stress management was documented at least once in the patient record. The JNC 7 guidelines specify the importance of teaching diets that emphasize low salt and high fruit and vegetable intake as well as encourage weight reduction diets if body mass index is 30 Kg/m² or greater [3]. Given the low documentation of any teaching, the diet category was collapsed to allow credit for any mention of diet teaching in general without specifying the exact diet taught.

The pharmacologic treatment subscale assessed for use of diuretics for patients in general, specific medications based on documented comorbidities (eg, angiotensin-converting enzyme [ACE] inhibitors for diabetes), and medication adjustment if patients were not at goal blood pressure. Goal was based on JNC 7 recommendations related to the presence of comorbidities: less than 140/90 mm Hg for patients in general, and less than 130/80 mm Hg for patients with documented diabetes or kidney disease [3].

Follow-up care measures included assessing visit schedule based on blood pressure levels as well as obtaining follow-up creatinine and potassium levels. Visit schedules were determined as meeting JNC guidelines if patients who were not at goal were seen at least once per month, more frequently if stage 2 hypertension, and patients who were at goal were seen at least once within 6 months.

The HQI was intended to be used to assess care provided to patients with a known diagnosis of essential hypertension. Thus, calcium levels, which are indicative of a secondary cause of hypertension, were not evaluated. Hematocrit also was not assessed as all patients had a complete blood count done and it was impossible to determine if the hematocrit was used to evaluate kidney function or as a simple screening test for other causes of anemia. Prior to implementation, the HQI was reviewed by certified hypertension specialists to ensure the content was consistent with JNC 7 guidelines.

Data Abstraction and Analysis

Chart audits were done by master's and doctorally prepared nurses who received over 10 hours of training on data collection procedures. Chart review was conducted for a 6-month period beginning with the first clinic visit at which the patient agreed to participate in the study. A 6-month time frame was chosen because even hypertensive patients whose blood pressure is well-controlled should be seen by their provider at least twice per year. In addition to completing the HQI, nurses recorded dates of visits, provider information, and patient demographic data. The reviewers made no judgments regarding probable clinical decisions;

Indicator	Present	not Present	n/a	optional	comments
cVd riskassessment					
Height & weight or BMI recorded	1	0			
Waist circumference recorded	—	—		1	
Cholesterol panel with LDL	1	0			
ECG baseline	1	0			
Urinalysis if nondiabetic	1	0	X		
Urinary albumin excretion or microalbuminuria within last year if diabetic or CKD	1	0	X		
Urinary albumin/creatinine ratio	—	—		1	
HbA _{1c} if diabetic	1	0	X		
Blood glucose if nondiabetic	1	0	X		
total cVd percentage = (present) + (optional)/7 minus n/a _____					
Lifestyle modification taught					
Physical activity	1	0			
Diet	1	0			
Low salt					
High fruits/vegetables					
Weight reduction if BMI \geq 30 Kg/m ²					
Smoking cessation	1	0	X		
Alcohol reduction	1	0	X		
Stress management	—	—	—	1	
total lifestyle percentage = (present) + (optional)/4 minus n/a _____					
Pharmacologic treatment					
Diuretic prescribed	1	0			
ACEI or ARB if diabetic or CKD	1	0	X		
b Blocker post-MI	1	0	X		
Two different classes of medications if stage 2	1	0	X		
Medications adjusted if not at goal	1	0	X		
total pharmacologic percentage = (present)/5 minus n/a _____					
Follow-up					
At least monthly visits unless at goal (if at goal, 2–3 visits/year)	1	0			
Creatinine 1–2x/year	1	0			
Potassium 1–2x/year	1	0			
total follow-up percentage = (present)/3 minus n/a _____					
total points					
	—	—			
overall adherence percentage = (total present) + (optional)/19 minus n/a _____					

Figure. Hypertension quality chart review index. ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin II receptor blocker; BMI = body mass index; CKD = chronic kidney disease; CVD = cardiovascular disease; ECG = electrocardiogram; HbA_{1c} = glycosylated hemoglobin; LDL = low-density lipoprotein; MI = myocardial infarction.

table 1. Baseline Characteristics of Sample

	audit Sample (Patients with ≥ 2 Visits) (n = 94)	nonreturning Patients (n = 34)
Sex, n		
Men	47 (50%)	19 (56%)
Women	47 (50%)	15 (44%)
Mean age, yr (range)	49 ± 8 (28–64)	49 ± 8 (34–62)
Mean education, yr (range)	12 ± 2 (6–20)	12 ± 2 (5–8)
Mean body mass index, Kg/m ² (range)	32.96 ± 7.38 (18.44–54.24)	31.10 ± 9.04 (18.12–56.08)
	12% Normal weight	26% Normal weight
	21% Overweight	32% Overweight
	38% Obesity I	12% Obesity I
	12% Obesity II	9% Obesity II
	17% Obesity III	21% Obesity III
Mean blood pressure, mm Hg		
Systolic (range)	141.61 ± 19.57 (104–219)	137.38 ± 17.91 (106–174)
Diastolic (range)	83.02 ± 13.56 (52–148)	81.97 ± 13.67 (58–118)
Provider type, by visit		
Physician	49 (52%)	26 (78%)
Nurse practitioner	45 (48%)	7 (22%)

index criteria were determined to be met or not met based solely on information documented. The provider seen most consistently by the patient was entered as the usual provider for data analysis purposes.

Relationships among subscales and total scores were calculated using Pearson's product-moment correlation. Differences in subscale and total scores and blood pressure outcomes were calculated using independent sample *t* tests or chi-square statistics.

results

The baseline characteristics of our sample are shown in **Table 1**. Of the original 128 patients, 26% (*n* = 34) did not have a second visit in the 6-month study period; thus, any changes in blood pressure were not available in the chart. An HQI score was calculated for the remaining 94 patients who had at least 2 documented visits in 6 months. Results for this group of 94 patients are reported.

There were no significant differences between the patients who did and did not return for a second visit based on sex, age, or education (Table 1; $\alpha = 0.05$; 1- $\beta = 0.70$). There were significant differences noted based on provider; 86% of patients initially seen by a nurse practitioner (45 of 52) returned for at least 1 follow-up visit compared with 64% of patients initially seen by a physician (49 of 76 [$X^2 = 6.66$; $P = 0.01$]). Three participants who had an initial physician visit received follow-up care with a nurse practitioner. Forty-five percent of the patients were able to see the same provider for all of their visits (provider consistency of 100%), while the

other patients saw the same provider for more than half of their visits (provider consistency of 58%).

The 94 patients in the quality analysis had a total of 364 visits, or an average of 4 visits during the 6-month study period. Twenty-four percent of the patients had diabetes, 5% had chronic kidney disease, and another 5% had both diabetes and kidney disease. There were no provider differences related to patient comorbidities.

Cardiovascular Risk Assessment

The degree of adherence with recommended cardiovascular risk assessment ranged from 20% to 120%. Scores above 100% reflect documentation that the provider performed "optional" recommendations (eg, obtaining a urinary albumin/creatinine ratio). The average score in this category was 85%, the highest of all subscale scores (**Table 2**). All patients had height and weight recorded, but body mass index was documented for only 4 patients. The majority of patients had documented baseline electrocardiograms (78%), cholesterol (93%), and blood glucose if not diabetic (88%). Among diabetic patients, 90% had glycosylated hemoglobin and 69% had microalbuminuria examinations done. Urinalysis in nondiabetic patients was documented only 43% of the time. There was no significant difference in cardiovascular risk assessment scores between physicians and nurse practitioners.

Lifestyle Modification

The average score for teaching related to lifestyle intervention was 57%, with scores ranging from 0 to 150% (Table 2).

table 2. Adherence to JNC 7 Guidelines and Blood Pressure Outcomes

	all	Physicians	nurse Practitioners	Significance
Mean cardiovascular risk assessment score (range)	0.85 ± 0.18 (0.20–1.20)	0.85 ± 0.18	0.84 ± 0.17	<i>p</i> = 0.79
Mean lifestyle modification score (range)	0.57 ± 0.49 (0–1.50)	0.44 ± 0.45	0.69 ± 0.50	<i>t</i> ₍₉₂₎ = 2.53 <i>p</i> = 0.01
Mean pharmacologic treatment score (range)	0.69 ± 0.33 (0–1.00)	0.75 ± 0.32	0.63 ± 0.33	<i>p</i> = 0.09
Mean follow-up score (range)	0.80 ± 0.23 (0–1.00)	0.81 ± 0.22	0.79 ± 0.25	<i>p</i> = 0.67
Mean total quality score (range)	0.76 ± 0.16 (0.27–1.08)	0.75 ± 0.15	0.77 ± 0.17	<i>p</i> = 0.45
Change in blood pressure, mm Hg				
Systolic (range)	−1.63 ± 19.74 (+44 to −60)	−4.76 ± 19.47	+1.37 ± 19.74	<i>p</i> = 0.13
Diastolic (range)	−2.26 ± 13.03 (+26 to −41)	−5.96 ± 14.23	+1.28 ± 10.76	<i>t</i> ₍₉₂₎ = 2.79 <i>p</i> = 0.006
Blood pressure goal achieved*				<i>p</i> = 0.42
Yes	44% (<i>n</i> = 41)	52% (<i>n</i> = 24)	40% (<i>n</i> = 19)	
No	56% (<i>n</i> = 53)	48% (<i>n</i> = 22)	60% (<i>n</i> = 29)	

NOTE: Providers who documented performing “optional” recommendations could achieve greater than 100% adherence.

*Less than 130/80 mm Hg if diabetes or chronic kidney disease, less than 140/90 mm Hg all others.

The mean number of times teaching was documented in any category was once, even though patients had an average of 4 visits where teaching could have occurred. Despite the high prevalence of obesity in the sample, dietary instruction was documented for only 57% of the patients and exercise instruction was documented for only 46%. Of the 41 patients who were self-identified as smokers, less than half had documentation of smoking cessation instruction. Of the 23 patients reporting an alcohol problem, 67% received alcohol cessation instruction. Nurse practitioners were significantly more likely than physicians to document teaching lifestyle interventions.

Pharmacologic Treatment

With regard to pharmacologic treatment, providers were adherent with JNC 7 guidelines 69% of the time (Table 2). All patients were on at least 1 antihypertensive medication. Eighty-one percent of the patients were on a diuretic, 88% of the patients with either diabetes or chronic kidney disease were on an ACE inhibitor or angiotensin II receptor blocker. The one patient who was post-myocardial infarction was not on a b blocker. Ninety-three percent (28 of 30) of patients with stage 2 hypertension were on at least 2 antihypertensive medications. The total number of antihypertensive drugs prescribed ranged from 1 to 5, with patients being on an average of 2.20 drugs. For patients not at goal, the average was slightly higher at 2.34. There were no significant differences between provider type in total number of medications prescribed or overall pharmacologic treatment scores. Physicians were significantly more likely to adjust the medications prescribed if the patient was not at

goal ($X^2 = 5.04; P = 0.025$), but adjusting medications was not significantly associated with goal attainment or decrease in systolic or diastolic blood pressure.

Follow-up Care

Providers were in adherence with follow-up recommendations 80% of the time. Within the past year, 90% of the patients had creatinine levels checked and 89% had potassium levels checked. The visit schedule adherence was 62%.

Overall Quality and Goal Attainment

All 4 subscales were positively and significantly related to the total quality index score ($P < 0.001$; Table 3). Although providers achieved 76% adherence with the JNC 7 guidelines, the overall quality score was not related to attainment of blood pressure goal (< 130/80 mm Hg for patients with diabetes or chronic kidney disease or < 140/90 mm Hg for all others). At the end of the study period, 44% were at goal. When the less stringent criteria of less than 140/90 mm Hg was used for all patients, 50% of the sample attained their blood pressure goal. Only the follow-up care subscale score was significantly related to blood pressure goal attainment ($r = 0.23; P = 0.03$). In addition to assessment of goal attainment, change in blood pressure also was evaluated. Overall, mean blood pressure values decreased during the study period, but the changes were not significant for the total group. Patients seen by physicians had a significantly greater decrease in diastolic pressure than those seen by nurse practitioners, achieving almost a 6 mm Hg decrease (Table 2). There was no significant relationship between any

table 3. Correlation Matrix

	cVd assessment	Lifestyle Modication	Pharmacologic treatment	Follow-up	total Score	BP at Goal
CVD risk assessment	—					
Lifestyle modification taught	0.027	—				
Pharmacologic treatment	0.242*	0.285†	—			
Follow-up	0.374‡	-0.159	0.054	—		
Total quality index score	0.667‡	0.617‡	0.568‡	0.439‡	—	
BP at goal	0.180	-0.128	0.011	0.228*	0.087	—
Mean	0.85	0.57	0.69	0.80	0.76	
SD	0.18	0.49	0.33	0.23	0.16	

BP = blood pressure; CVD = cardiovascular disease; SD = standard deviation.

* $p < 0.05$.

† $p < 0.01$.

‡ $p < 0.001$.

subscale or total quality score and change in systolic or diastolic blood pressure. Nurse practitioners had slightly higher quality scores (ie, increased adherence with guidelines), and physicians had slightly higher rates of blood pressure goal attainment, but neither of these findings were statistically significant.

Because health outcomes may be affected by the patient-provider relationship, we evaluated blood pressure outcomes controlling for the consistency with which patients saw the same provider at each visit. The Brice continuity of care index [15] was used to calculate provider consistency scores. Nurse practitioners had significantly greater consistency in patient visits than physicians ($t_{(92)} = 4.85; P < 0.001$), but consistency was not associated with any of the quality index scales. There was an unexpected inverse relationship found in that less provider consistency was associated with greater decreases in diastolic blood pressure ($r = -0.24; P = 0.019$).

discussion

This study evaluated provider adherence with JNC 7 guidelines using a comprehensive quality index. Providers in this urban clinic for low-income patients achieved a level of adherence higher than that documented in other studies [7,10]. The highest quality score was obtained in the area of cardiovascular risk assessment, which suggest that providers are cognizant of the risk factors contributing to target organ damage. However, evaluating for kidney disease risk was not well documented, as less than half of nondiabetic patients had urinalysis performed and nearly a third of the diabetic patients were not assessed for microalbuminuria or proteinuria. Additionally, while the vast majority of patients had creatinine levels drawn, it is unclear from the chart reviews if providers used that data to calculate the

estimated glomerular filtration rate, which is not included in the laboratory reports. For patients with a diagnosis of diabetes or chronic kidney disease, there was wide acceptance of treating with an ACE inhibitor or angiotension II receptor blocker.

Lifestyle modification was the category with the lowest quality score and the only guideline area in which there were significant provider differences. The deficits in documentation of lifestyle teaching warrant comment in light of the current trend of “pay for performance” quality monitoring [16,17]. The current reimbursement structure creates disincentives for teaching and counseling during the clinical visit, which contradicts national guidelines and quality of care recommendations [17]. Moreover, recent analyses suggest that “paying” for performance may not be an effective incentive for improved quality [18], especially in patients with comorbid conditions [19]. Yet, as the pay for performance assessments move from a productivity-based incentive plan to a focus on quality, the documentation of care according to established guidelines will become a critical factor in provider evaluations. Until such time that electronic health records are standard within most health systems and a balance between productivity and quality assessments are the norm, documentation of teaching and counseling will continue to be a challenge to the quality monitoring process [20].

In this group of low-income African-American patients, stringent blood pressure goals were met among 44% of the patients, and 50% achieved the blood pressure goal of less than 140/90 mm Hg, which is comparable with national averages [4]. Although providers were 69% adherent with pharmacologic treatment guidelines, 62% of the patients who were not at goal were taking less than 3 antihypertensive

medications. Numerous studies have shown that it takes an average of 3.4 medications to achieve blood pressure control [3]. Additionally, 64% of patients not at goal at a particular visit did not have their medication intensified.

Follow-up visit schedule was the only factor significantly related to blood pressure goal attainment, but there was no correlation between visit schedule and medication adjustment. Follow-up visits without a purposeful link to treatment intensification may not be a cost-effective strategy for hypertension management. Although blood pressure goals were not achieved for half of the patients, a decrease of 5 mm Hg in systolic blood pressure and of 6 mm Hg in diastolic blood pressure in the physician group is an important finding. Contrary to previous research [21–23], provider consistency was inversely related to changes in blood pressure, raising the question of whether being unfamiliar with the patient or discontinuity resulted in resident physicians being more aggressive with blood pressure management. A study of nurse practitioners found that longer-term relationships diverted the provider and patient toward alternate social or family issues and away from the “medical” aspects of care [24], suggesting that an emphasis on relationship building could be deleterious to the patient’s physical health. Anecdotal findings in the current study, however, revealed that nurse practitioner documentation focused on multiple medical issues at most visits (eg, vaginitis, mammograms, Pap smears), whereas physician documentation focused on blood pressure management. A larger sample and a study that specifically addresses follow-up care, medication intensification, prescription usage, and the nuances of chronic disease management would provide a better understanding of the relationship among these variables [25]. The fact that 26% of the original subjects did not return for a second visit in 6 months and the majority of those patients were seen by a resident physician underscores the importance of evaluating the interpersonal processes that affect trust and patient willingness to return for care [26].

This study also evaluated differences in guideline adherence and hypertension outcomes by provider type. Differences were noted in certain aspects of the care provided. Patients seen by nurse practitioners were significantly more likely to return for at least 1 follow-up visit and receive lifestyle teaching in all areas, while physicians were more likely to make medication adjustments and achieved greater reductions in diastolic blood pressure readings. The diastolic blood pressure reduction difference contradicts earlier research comparing nurse practitioners and physicians [12,27]. However, these findings are consistent with other research that has shown that nurse practitioners and physicians achieve similar health outcomes but use different processes of care [12,27–30].

Nurse practitioner education places significant emphasis on the interpersonal aspects of care. As a result, nurse prac-

tioners are more likely to spend time teaching and counseling patients regarding lifestyle changes prior to intensifying pharmacologic treatments as compared with physicians. In contrast, resident physicians report low rates of cardiovascular disease counseling [31] and low confidence in lifestyle counseling interventions in primary care [31,32]. Although behaviors can be increased and confidence gained through targeted interventions [32–34], resident physicians report numerous barriers to behavioral counseling, including time limitations, perceived ineffectiveness, and a lack of training [35–38]. Given that more than half of the patients seen by both types of providers did not attain blood pressure goal suggests that a collaborative model of care may be an effective option for achieving better control and a higher overall level of quality of care. One study compared the quality of hypertension outcomes for groups treated by physicians versus groups treated by a physician-nurse (non-nurse practitioner nurses) team [39]. The physician-nurse team demonstrated lower mean systolic and diastolic pressures and a higher score for blood pressure medication knowledge. Unfortunately, the paper did not define the dynamics of the nurse-physician team, leaving unclear the effect of the nurse’s role or whether members of the team had contact with the patient together or individually. Other research has found that patients’ lack of understanding of the disease process, concerns over side effects of medications, and lack of shared decision making are associated with lack of adherence to antihypertensive regimens [40,41]. A team approach that combines the interpersonal emphasis of the nurse practitioner with the technical emphasis of the physician could be a viable solution to these nonadherence challenges.

Findings from the current study need to be interpreted in light of the study limitations. The number of returning patients was small and reflects a potential selection bias. Additionally, although the patients had severe income limitations, they had access to both health care and medications. It may be that these 2 factors are more important than guideline adherence in achieving blood pressure control. Additionally, the current study shares the limitations common to quality audits and chart reviews. Nurse completion of the HQI was time- and effort-intensive. The time-intensive nature of comprehensive quality indicator tools is a well-known dilemma in the area of process improvement [11]. Developing standardized instruments and data collection processes to ensure the reliability and ease of use of quality measures is an important step in improving the quality of care provided to patients with hypertension. Additionally, chart reviews are limited by the level of documentation recorded. Such reviews cannot determine if the deficit noted is due to level of provider skill or reflective of time and documentation constraints. A comparison of providers across a variety of documentation systems would provide

insight into the usefulness of the HQI to assess the quality of care provided.

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Corresponding author: Rosalind M. Peters, PhD, RN, Wayne State University College of Nursing, 5557 Cass Ave., Rm. 358, Detroit, MI 48202, rpeters@wayne.edu.

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