ORIGINAL RESEARCH

Patient Factors Associated With Documented Provision of JNC 7–Recommended Hypertension Care at an Academic Family Medicine Office

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Background: **Little is known about patient factors associated with the provision of hypertension care as recommended by JNC 7.**

Methods: **We conducted a retrospective chart review (n = 150) to compare documented provision of items recommended by JNC 7 with various patient factors, using a 15-point scoring tool (0% to 100%).**

Results: **The overall documentation of JNC guideline-recommended care was 78.3%. There was a significant effect of marital status; married patients received more guideline-recommended care than unmarried patients (80.4% vs 74.4%; *P* = .02). Men received more guideline-recommended care than women (80.7% vs 76.4%; *P* = .02). Multivariate analysis revealed that Medicaid patients had 7.1% lower rates of guideline-recommended care than patients with other insurance (*P* = .05). There was no significant difference in guideline-recommended care based on race/ethnicity; however, racial/ethnic disparities were identified for certain individual standards.**

Conclusions: **Hypertension care in 2013 at an academic family medicine center was, for the most part, in agreement with guidelines; however, provision of some items varied based on sex, marital status, and insurance. Awareness of these predictors may help improve the implementation of guidelines, particularly relevant given the recent release of JNC 8. (J Am Board Fam Med 2015;28:97–104.)**

Keywords: **Evidence-Based Medicine, Guideline Adherence, Hypertension**

Hypertension is the most common adult primary care diagnosis in America[1] and is a major contributor to cardiovascular mortality and morbidity. Defined by the JNC 7 guidelines as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, hypertension has a high prevalence among the US population.[2] Approximately 29.1% of adults aged 18 and older were diagnosed with hypertension from 2011 to 2012. Among these patients, the rate of blood pressure control was only 51.9%.[3] The number of patients with hypertension is projected to increase because of the aging population and the obesity epidemic, with which hypertension is inexorably tied.[4]

In addition to its high prevalence, hypertension also has drawn attention for its contribution to increasing health care costs. Undertreatment of hypertension generated approximately $13 billion in additional costs in 2009,[5] with an additional $23.6 billion lost because of hypertension-driven losses in productivity.[4] Hypertension's pervasiveness, costs, and strong relationship to mortality and morbidity have made it a major national health objective. The Healthy People 2020 program calls for a reduction in prevalence to 26.9% (heart disease and stroke (HDS)-5) and an increase in the rate of blood pressure control to 61.2% (HDS-12).[6]

Disparities in hypertension diagnoses among the US population have been well documented.[7] Prevalence is highest among non-Hispanic black adults (42.1%), followed by non-Hispanic white adults (28.0%), Hispanic adults (26.0%), and non-Hispanic Asian adults (24.7%).[3] Non-Hispanic white adults have the highest rate of blood pressure con-

This article was externally peer reviewed.
Submitted 3 September 2014; revised 26 September 2014; accepted 9 October 2014.
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Funding: none.
Conflict of interest: none declared.
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trol (53.9%) compared with non-Hispanic black adults (49.5%), Hispanic adults (46.5%), and non-Hispanic Asian adults (46.0%).[3] Access to health insurance also seems to play a role; uninsured adults have a lower rate of blood pressure control (27.9%) compared with adults with private (50.6%) or public (60.2%) insurance.[8] These variations in disease burden underscore the importance of targeting vulnerable groups to achieve population-wide improvements in hypertension outcomes.

The use of evidence-based guidelines like JNC 7 has been identified as crucial for achieving blood pressure goals.[4] The implementation of these guidelines has yielded mixed results, however, as evidenced by previous studies.[9] There are numerous roadblocks to providing guideline-recommended care, including a lack of provider familiarity/awareness; disagreement with guidelines; therapeutic inertia; provider attitudes, such as a lack of self-efficacy and a lack of outcome expectancy; and patient resistance to recommendations.[10] The role of patient factors driving guideline-inconsistent care has not been fully elucidated, however, and little is known about the relationship between patient factors and the provision of JNC-recommended care.

We hypothesized that there are disparities along racial/ethnic lines, with increased documented JNC-recommended care for non-Hispanic white patients than for non-Hispanic black and Hispanic patients. Our study makes use of a scoring tool developed and used to evaluate care based on JNC guidelines[11] to assess patient factors that are predictive of documented consistency with JNC 7 recommendations.

Methods

The scoring criteria used in this study were adapted from a tool specifically developed to assess the documentation of hypertension care based on JNC 7 in 4 domains: (1) diagnosis, (2) pharmacological therapy, (3) follow-up care, and (4) laboratory monitoring.[11] Modifications were made to focus on those guidelines based on specified evidence as opposed to those based on expert opinion. Recommendations for which JNC 7 did not provide specific references (eg, recommended frequency of follow-up visits) were excluded from our scoring tool. In addition, pharmacological criteria were condensed from 7 criteria to 2—monotherapy and combination therapy—to better reflect JNC 7 treatment algorithms.[2] These changes resulted in a 15-point scoring tool that was used to score the documentation of hypertension treatment in 2013 for each subject (Table 1). In the diagnosis, pharmacological therapy, and laboratory monitoring domains, each criterion was scored only once across all visits as either met (1), unmet (0), or not applicable (9). In the follow-up domain the "lifestyle modification" criterion was scored as met (1) if it was met during ≥50% of visits and unmet (0) if it was met at <50% of those visits. The "uncontrolled hypertension" criterion was scored as unmet (0) if there was any instance at which an office blood pressure measurement ≥140/90 mmHg was not addressed in the progress note. If an office measurement exceeded this benchmark but mention was made of home readings that were at goal,

Table 1. Documentation of Care Recommended By JNC 7

Criteria	Weight
Diagnosis	
1. Cardiovascular risk factors	1
2. Identified blood pressure goal	1
3. BP goal was communicated to the patient, verbally or in writing	1
Pharmacology	
4. Monotherapy where appropriate (stage I HTN)	2
5. Combination therapy where appropriate (stage II HTN or stage I HTN with comorbidities)	2
Follow-up	
6. Absence of BP control noted whenever office BP measurements exceed 140/90 mm Hg	1
7. Lifestyle modifications discussed during at least 50% of encounters	1
Laboratory monitoring	
8. Fasting lipid panel measured within past 12 months	2
9. Patients with diabetes mellitus and/or chronic kidney disease screened for urine albumin within past 12 months	2
10. Serum creatinine measured within past 12 months	2
11. Blood glucose measured within past 12 months	2
12. Hematocrit measured within past 12 months	1
13. Serum potassium measured within past 12 months	1
14. Serum calcium measured within past 12 months	1
15. EKG measured at any point in the past	2

BP, blood pressure; EKG, electrocardiogram; HTN, hypertension.

the criterion was scored as met (1) to account for the relatively high prevalence of white coat hypertension.[12] Selected criteria deemed important to hypertension care were assigned a weight of 2, as determined by the developers of the scoring tool.[11]

Subjects

All patients with a current diagnosis of hypertension seen at the University of South Florida Family Medicine clinics during the period January 1 to December 18, 2013, were identified using the clinic's electronic health record system (Allscripts), which contained all relevant medical information. The clinic, part of an academic health center, includes 9 board-certified attending family physicians and 2 full-time physician assistants. Medical students are regularly present in the clinic; however, there are no residents. There are approximately 23,000 visits to the clinic annually. The patient population from which subjects were selected is 70.7% non-Hispanic white, 14.8% non-Hispanic black, and 10.9% Hispanic.

To better assess possible racial/ethnic disparities in care, subjects were first stratified by race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic) and placed in random order. Subjects then were screened for eligibility based on a set of predetermined inclusion and exclusion criteria (Table 2). To be included, subjects needed to have a minimum of 3 visits to the family medicine clinic in 2013 and be an established patient of the clinic, with at least 1 visit per year for each of the past 3 years, based on the Current Procedural Terminology definition for an established patient. A total of 50 subjects from each racial/ethnic group were included, for a total sample size of 150 subjects. This study oversampled non-Hispanic black and Hispanic patients to maximize statistical power about potential health disparities.

Table 2. Eligibility Criteria

Inclusion	Age at least 21 years
	Diagnosed with hypertension
	Established patient (defined by at least 1 visit/year for the past 3 years)
	At least 3 visits in 2013
Exclusion	Evidence of hypertensive emergency
	Myocardial infarction in the past 6 months
	Heart failure
	Unstable angina
	Serious renal disease (ie, CKD stage IV and V, renal failure) or hepatic disease
	Pregnancy
	Dementia/cognitive impairment

CKD, chronic kidney disease.

Data Collection

Data were collected from a retrospective chart review of electronic medical records. Once a patient chart was identified, all visits to the family medicine clinic in 2013 were considered eligible for data collection. Data regarding hypertension care were extracted using the aforementioned scoring tool. Selected demographic variables, including race, ethnicity, education, marital status, and insurance type, also were recorded. Information regarding the degree of patient interaction with the clinic, including the number of years the patient had been in the practice, the number of office visits to the family medicine clinic in 2013, and the continuity of their care, was collected. Continuity of care was evaluated using the Usual Provider Continuity Index, similar to other studies.[13] Overall scores measuring documentation of guideline-recommended care were calculated for each patient by adding the scores for each applicable criteria and dividing by the total possible score for that patient (potential range, 0% to 100%).

Data Analysis

Student t tests, χ^2 tests, Pearson correlation coefficients, and analysis of variance were used to compare scores across patient and clinical characteristics. Documentation of certain individual JNC 7 items also was assessed to determine potential racial/ethnic disparities in the documented provision of particular recommendations. Multivariable linear regression using the least squares method was used to determine independent predictors of documentation of guideline-recommended care. A stepwise variable selection algorithm was used to create the most parsimonious model. All P values are 2-tailed, and α was set at 0.05. SAS statistical software 9.3 (SAS Institute Inc., Cary, NC) was used in the analysis.

Results

Subjects

There were 83 women and 67 men. The average age was 64.7 years (standard deviation [SD], 12.7 years). The average time spent as a patient of the

clinic was 8.3 years (SD, 4.6 years), and patients had an average of 4.5 visits (SD, 2.0 visits) to the clinic in 2013.

Documentation of JNC 7–Recommended Care

Overall documentation of JNC 7–recommended care was high, with a mean score of 78.3% (SD, 12.4%). Scores for individual JNC 7 goals were typically moderate or high, with some exceptions (Table 3). For instance, documentation of cardiovascular risk factors such as diabetes, elevated cholesterol, obesity, tobacco use, and family history was completed for 96.7% of patients.

Scores were lower for other JNC 7 recommendations. Documented blood pressure goals were explicitly identified for only 18.7% of patients. Documentation that the goal had been given to the patient verbally or in writing existed for only 10.7% of patients.

The documentation of JNC-recommended pharmacological treatment was high. All patients for whom monotherapy was indicated (ie, stage I hypertension without compelling indications) were prescribed that regimen. When a multidrug regimen was indicated because of stage II hypertension and/or compelling indications, 97.7% of patients were prescribed that regimen.

JNC-recommended laboratory monitoring practices were well documented in the charts, although there was some variability. Scores were highest for serum creatinine (96.7%), blood glucose (96.7%), serum potassium (96.7%), and serum calcium (96.7%). Fasting lipid profiles were documented for 92.6% of patients. JNC recommendations with the lowest degree of documentation were electrocardiography (EKG) (78.0%) and hematocrit (69.8%) and microalbumin tests for patients with diabetes and/or chronic kidney disease (68.8%).

In the follow-up domain, providers documented that hypertension was uncontrolled in 88.7% of cases in which office blood pressure readings exceeded 140/90 mmHg. However, documentation that patients were counseled on lifestyle modifications at >50% of their visits was identified for only 22% of patients.

Table 3. Documentation Scores for Individual Criteria

Criteria	Documentation Score, % (n/N)
Items evaluated once during the entire audit period	
Cardiovascular risk factors	96.7 (145/150)
Identified BP goal	18.7 (28/150)
BP goal communicated to patient	10.7 (16/150)
Patient is treated with monotherapy when appropriate (stage 1 HTN)	100.0 (67/67)
Patient is treated with combination therapy when appropriate (stage 2 HTN or stage 1 HTN with comorbidities)	97.7 (83/85)
Fasting lipid profile*	92.6 (138/149)
Patients with diabetes or CKD screened for urine albumin*	68.8 (53/77)
Serum creatinine*	96.7 (145/150)
Blood glucose*	96.7 (145/150)
Hematocrit*	69.8 (104/149)
Serum potassium*	96.7 (145/150)
Serum calcium*	96.7 (145/150)
EKG performed at any point	78.0 (117/150)
Items evaluated during multiple visits	
Absence of BP control mentioned in progress note when applicable	88.7 (63/71)
Discussion of lifestyle modification documented for at least 50% of visits in audit period	22.0 (33/150)

*Measured within the past 12 months.
BP, blood pressure; CKD, chronic kidney disease; EKG, electrocardiogram; HTN, hypertension.

Predictors of Documentation of JNC-Recommended Care: Marital Status, Sex, and Insurance

There was a significant difference in documented JNC-recommended care based on marital status; married patients differed significantly from all other patients ($P = .002$, analysis of variance). Documentation of JNC-recommended care was higher for married patients (80.4%; SD, 7.3%) than unmarried patients (74.4%; SD, 17.6%) ($P = .02$). Documented JNC 7–consistent care was lowest for single patients (72.4%; SD, 19.5%). We also found a significant difference based on sex. Documentation of JNC-recommended care was 76.4% (SD, 15.0%) for women and 80.7% (SD, 7.4%) for men ($P = .02$) (Table 4).

Disparities: Race/Ethnicity

Overall documentation of JNC-recommended care did not differ significantly across different racial/ethnic groups. Non-Hispanic white patients had similar rates of documented guideline-recommended care (76.9%; SD, 14.5%) compared with non-Hispanic black patients (77.9%; SD, 12.5%) and Hispanic patients of any race (80.1%; SD, 9.7%). Additional analysis was conducted to assess whether there were disparities with regard to se-

Table 4. Sample Descriptive Statistics and Documentation Scores

Continuous Data	Values*	Documentation Scores (%)†
Age (years), mean (SD)	64.7 (12.7)	—
Years in practice, mean (SD)	8.3 (4.6)	—
Visits in 2013, mean (SD)	4.5 (2.0)	—
Continuity of care, mean (SD)‡	0.8 (0.2)	—
Race/ethnicity		
Non-Hispanic white	33.3 (50/150)	76.9 (14.5)
Non-Hispanic black	33.3 (50/150)	77.9 (12.5)
Hispanic (any race)	33.3 (50/150)	80.1 (9.7)
Sex		
Female	55.3 (83/150)	76.4 (15.0)
Male	44.7 (67/150)	80.7 (7.4)
Marital Status		
Single	18.2 (27/148)	72.4 (19.5)
Married	62.8 (93/148)	80.4 (7.3)
Divorced/widowed	18.9 (28/148)	76.4 (15.6)
Insurance		
Private	39.3 (59/150)	77.4 (14.9)
Medicare	31.3 (47/150)	79.9 (11.2)
Medicare Advantage	21.3 (32/150)	79.6 (7.3)
Medicaid	8.0 (12/150)	72.8 (13.6)

*Data are % (n/N) unless otherwise indicated.
†Data are mean (standard deviation).
‡Measured by the Usual Provider Continuity Index (percentage of visits to the same provider).
SD, standard deviation.

lected individual JNC 7 recommendations. There were 2 major findings. First, non-Hispanic white patients more frequently had a documented blood pressure goal in their chart (30.0%) than did non-Hispanic black patients (14.0%) and Hispanic patients (12.0%) (P = .04). Second, non-Hispanic white patients were less likely to have an EKG on file (68.0%) than all nonwhite patients (83.0%) (P = .04). Of non-Hispanic black patients and Hispanic patients, 80.0% and 86.0%, respectively, had an EKG in their medical record.

In multivariable analysis 5 patient/clinical characteristics emerged as independent predictors of documented guideline-recommended care. Single patients had less documentation of guideline-recommended care (vs all others; parameter estimate, −0.07; P = .003), as did patients with Medicaid insurance (vs all others; parameter estimate, −0.07; P = .047), whereas male patients had higher rates of documented JNC-recommended care (parameter estimate, 0.04; P = .047). Finally, documentation of JNC-recommended care increased with the number of years in the practice (parameter estimate, 0.005; P = .009) and number of visits during the year (parameter estimate, 0.01; P = .04). Model fit was assessed using R^2 (0.16) and C(p) statistics (5.53).

Discussion

Our study made use of a comprehensive scoring tool to assess the documentation of JNC-recommended care and to explore its relationship to various patient factors. We found that documentation of JNC-recommended care was high overall but markedly lower for guidelines on blood pressure goal documentation, communication, and lifestyle modification counseling. In addition, we found that documentation varied based on several patient factors, including marital status, sex, and insurance status. Finally, we found no racial/ethnic disparities in overall documentation of JNC-recommended care; however, there were racial/ethnic differences with regard to some individual standards.

Documentation of JNC 7–Recommended Care

Our study found that documentation of JNC 7–recommended care was approximately 78%, suggesting that care at the clinic is largely consistent with clinical guidelines. To our knowledge, only one other study made use of a similar scoring tool, and it found a more modest rate of 53.5%.[14] This discrepancy may be attributable to a number of factors. First, we evaluated the care of hypertension based on visits in 2013, whereas the other study examined visits in 2004, only 1 year after the release of the JNC 7 report. Though awareness was not surveyed in either study, in 2013 physicians were ostensibly at least somewhat more familiar with JNC 7 than they were in 2004. If this is the case, it is reasonable to postulate that this would be reflected in medical documentation. Second, the previous study evaluated the documentation of appropriate pharmacological therapy based on the prescription rates of specific antihypertensive drugs, whereas our scoring tool was based on the quantity of drugs in the regimen (ie, monotherapy vs combination therapy). Thus our tool may have been less sensitive in detecting deviations from JNC 7–recommended pharmacological criteria for patients with specific comorbidities. Another contributor to our findings may be the clinic's

Allscripts electronic record system. For example, documentation of cardiovascular risk factors may have been facilitated by the relative ease with which a patient's active problems, medical history, family history, social history, and body mass index can be accessed. Finally, our study included patients with well-controlled hypertension, whereas the earlier study focused only on the care of patients with uncontrolled hypertension.

Scores for documenting blood pressure goals (18.7%) and communicating goals to the patient (10.7%) were both low. These findings may simply reflect omission from the medical record, particularly if the patient's hypertension was controlled. However, poor awareness of blood pressure goals has repeatedly been demonstrated in the literature. One patient survey found that 71.7% of patients could not identify a target systolic blood pressure[15]; another found that only 27% of hypertensive patients identified elevated blood pressure as high.[16] Specifying a blood pressure goal has repeatedly been identified as a crucial component of hypertension care,[17] particularly because patients may have different blood pressure goals based on comorbidities.[18] Clear and consistent identification and communication of blood pressure goals may lead to improvements in hypertension management. More direct evaluation of the application of this JNC recommendation is warranted to determine whether this finding reflects a simple omission from medical documentation or the quality of hypertension care. In addition, it was previously mentioned that the electronic record system facilitated the rapid viewing of cardiovascular risk factors. Adding the ability to view blood pressure targets and treatment goals may facilitate the management of hypertension and other chronic conditions.

In addition, the low documentation of lifestyle modification counseling (22.0%) is noteworthy. JNC 7 guidelines contain a number of dietary and exercise recommendations, including the Dietary Approaches to Stop Hypertension diet, restricted sodium intake, increased exercise, and reduced alcohol consumption,[19,20] which have been repeatedly linked to improved hypertension outcomes[21,22] and overall reduced risk of cardiovascular disease.[23] Interestingly, African-American patients may be particularly sensitive to the blood pressure–lowering effects of these modifications, suggesting that dietary and exercise recommendations are a key tool in improving the health of this population.[24]

Low documentation of this recommendation may be attributable to a simple omission from the progress note that this counseling took place. A more focused study of the nature of lifestyle modification counseling for hypertensive patients is warranted. If the documentation does reflect the nature of the care, however, there are a number of factors to consider. First, physicians may be uncertain of some of the finer points of dietary recommendations for hypertension management. This has been noted in surveys of physicians regarding the effect of diet on other cardiovascular conditions, such as hyperlipidemia.[25] Second, physicians may be less rigorous in diet and exercise recommendations, particularly given the extremely high prevalence of obesity in the United States. It is possible that there is a "lack of outcome expectancy" and thus a reduced focus on this aspect of hypertension management.[26] Alternative reasons for our finding include the effect of acute care visits during which hypertension was not specifically addressed.

Predictors of Documentation of JNC 7–Recommended Care: Marital Status, Sex, and Insurance

Our study found a significant effect of marital status; married patients had a greater likelihood of documented guideline-recommended care. Though it has previously been demonstrated that marital status plays a role in hypertension prevalence and control,[27] our study suggests there may also be an effect on the documented application of JNC recommendations. Further study of this phenomenon is warranted.

The significant difference based on sex is consistent with other previously identified disparities. A study of hypertension care at a student-run clinic found lower blood pressure control rates for women than for men,[28] and another study found that women received only 64% of JNC-recommended care.[29] Though the sex difference in our study was small, physicians are more likely to underestimate cardiovascular risk for women than for men,[30] which may contribute to the lower documentation of JNC-recommended care found in our study.

Finally, our study found that documentation of JNC 7–recommended care was lower for Medicaid patients than patients with all other types of insurance. Studies comparing the quality of hypertension care between patients with Medicaid and pa-

tients with other types of insurance are limited, however, and more general studies found no significant differences.[31,32] If the lower documentation rate reflects reduced application of JNC guidelines, then this may be attributable to a range of factors, including concerns about costs and reimbursement or a lack of outcome expectancy, as discussed earlier. A more focused study of this finding is needed to elucidate the effect of insurance. We found no significant disparities along racial or ethnic lines, however, suggesting that application of the JNC 7 guidelines may be one way to ensure an equal quality of care for patients of all racial and ethnic backgrounds.

Limitations

Our study has some important limitations. First, data were collected from a chart review and, as such, our findings may reflect the completeness of medical recordkeeping rather than the actual nature of hypertension care. Application of JNC 7 standards may indeed by higher than was reflected in the documentation. Similarly, the retrospective nature of our study prevented us from assessing whether blood pressure measurement techniques were compliant with JNC 7, which may have affected the accurate identification of controlled and uncontrolled hypertension. Second, all patients were selected from a medical clinic in an academic environment. As such, our findings may not be fully generalizable to nonacademic clinics, hospitals, or private practices. We oversampled Hispanic and non-Hispanic black patients to assess potential racial/ethnic disparities in care, so these groups are over-represented in our pooled analyses. Given the lack of racial/ethnic disparities in outcomes, this should have limited impact on our overall pooled analysis. Finally, we acknowledge that the provision of guideline-recommended care may be influenced by a complex interaction of patient, physician, and health care system factors. We recognize that there may be sound clinical reasons that care deviated from JNC guidelines and that these reasons may not always be evident in a medical record review.

Conclusion

The recent release of the JNC 8 hypertension guidelines raises inherent questions about their practical application, making this study particularly topical. Like its predecessor, JNC 8 emphasizes setting a blood pressure goal and consistently pursuing lifestyle modification, indicating a need for improved documentation in these categories. Further, though documentation of hypertension care at an academic family medicine clinic in 2013 was, for the most part, in agreement with guidelines, we found a number of patient factors that were associated with documented guideline consistency, namely, marital status, sex, and insurance status. It is possible that these characteristics will continue their association with the new standards, and awareness of these predictors may enable the more successful implementation of JNC 8 guidelines into everyday clinical practice.

The authors thank Eduardo Gonzalez, MD, and Kira Zwygart, MD, for their careful review of this manuscript.

References

1. Centers for Disease Control and Prevention. National Ambulatory Medical Care Survey: 2010 summary tables. Available from: http://www.cdc.gov/nchs/data/ahcd/namcs_summary/2010_namcs_web_tables.pdf. Accessed November 15, 2014.
2. Chobanian AV, Bakris GL, Black HR, et al; Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National Heart, Lung, and Blood Institute; National High Blood Pressure Education Program Coordinating Committee. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003;42:1206–52.
3. Nwankwo T, Yoon SS, Burt V, Gu Q. Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011–2012. NCHS Data Brief 2013;(133):1–8.
4. Heidenreich PA, Trogdon JG, Khavjou OA, et al. Forecasting the future of cardiovascular disease in the United States: a policy statement from the American Heart Association. Circulation 2011;123:933–44.
5. Balu S. Estimated annual direct expenditures in the United States as a result of inappropriate hypertension treatment according to national treatment guidelines. Clin Ther 2009;31:1581–94.
6. U.S. Department of Health and Human Services, Office of Disease Prevention and Promotion. Healthy People 2020. http://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke/objectives. 2011.
7. Giles T, Aranda JM Jr, Suh DC, et al. Ethnic/racial variations in blood pressure awareness, treatment, and control. J Clin Hypertens (Greenwich) 2007;9:345–54.

8. Gillespie CD, Hurvitz KA. Prevalence of hypertension and controlled hypertension - United States, 2007–2010. MMWR Surveill Summ 2013;62(Suppl 3):144–8.
9. Milchak JL, Carter BL, Ardery G, James PA. Measuring adherence to hypertension guidelines. Hypertension 2004;44:602–8.
10. Cabana MD, Rand CS, Powe NR, et al. Why don't physicians follow clinical practice guidelines? JAMA 1999;282:1458–65.
11. Milchak JL, Carter BL, Ardery G, et al. Development of explicit criteria to measure adherence to hypertension guidelines. J Hum Hypertens 2006;20: 426–33.
12. Franklin SS, Thijs L, Hansen TW, O'Brien E, Staessen JA. White-coat hypertension: new insights from recent studies. Hypertension 2013;62:982–7.
13. Rodriguez HP, Marshall RE, Rogers WH, Safran DG. Primary care physician visit continuity: a comparison of patient-reported and administratively derived measures. J Gen Intern Med 2008;23:1499–502.
14. Ardery G, Carter BL, Milchak JL, et al. Explicit and implicit evaluation of physician adherence to hypertension guidelines. J Clin Hypertens (Greenwich) 2007;9:113–9.
15. Alexander M, Gordon NP, Davis CC, Chen RS. Patient knowledge and awareness of hypertension is suboptimal: results from a large health maintenance organization. J Clin Hypertens (Greenwich) 2003;5: 254–60.
16. Oliveria SA, Chen RS, McCarthy BD, Davis CC, Hill MN. Hypertension knowledge, awareness, and attitudes in a hypertensive population. J Gen Intern Med 2005;20:219–25.
17. Jones D, Basile J, Cushman W, et al. Managing hypertension in the southeastern United States: applying guidelines from the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI). Am J Med Sci 1999;318:357–64.
18. Cushman WC, Basile J. Achieving blood pressure goals: why aren't we? J Clin Hypertens (Greenwich) 2006;8:865–72.
19. Lenz TL, Monaghan MS. Lifestyle modifications for patients with hypertension. J Am Pharm Assoc 2008; 48:e92–9.
20. Wexler R, Aukerman G. Nonpharmacologic strategies for managing hypertension. Am Fam Physician 2006;73:1953–6.
21. Kim HI, Song Y, Kim W, Lee JE. Association of adherence to the Seventh Report of the Joint National Committee guidelines with hypertension in Korean men and women. Nutr Res 2013;33:789–95.
22. Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on blood pressure of reduced sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. N Engl J Med 2001;344:3–10.
23. Craddick SR, Elmer PJ, Obarzanek E, Vollmer WM, Svetkey LP, Swain MC. The DASH diet and blood pressure. Curr Atheroscler Rep 2003;5:484–91.
24. Appel LJ, Brands MW, Daniels SR, Karanja N, Elmer PJ, Sacks FM. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. Hypertension 2006;47:296–308.
25. Flynn M, Sciamanna C, Vigilante K. Inadequate physician knowledge of the effects of diet on blood lipids and lipoproteins. Nutr J 2003;2:19.
26. Handler J, Lackland DT. Translation of hypertension treatment guidelines into practice: a review of implementation. J Am Soc Hypertens 2011;5:197–207.
27. Keenan NL, Rosendorf KA; Centers for Disease Control and Prevention (CDC). Prevalence of hypertension and controlled hypertension - United States, 2005–2008. MMWR Surveill Summ 2011; 60(Suppl):94–7.
28. Zucker J, Gillen J, Ackrivo J, Schroeder R, Keller S. Hypertension management in a student-run free clinic: meeting national standards? Acad Med 2011; 86:239–45.
29. Asch SM, Kerr EA, Lapuerta P, Law A, McGlynn EA. A new approach for measuring quality of care for women with hypertension. Arch Intern Med 2001;161:1329–35.
30. Mosca L, Linfante AH, Benjamin EJ, et al. National study of physician awareness and adherence to cardiovascular disease prevention guidelines. Circulation 2005;111:499–510.
31. Duru OK, Vargas RB, Kermah D, Pan D, Norris KC. Health insurance status and hypertension monitoring and control in the United States. Am J Hypertens 2007;20:348–53.
32. Weissman JS, Vogeli C, Levy DE. The quality of hospital care for Medicaid and private pay patients. Med Care 2013;51:389–95.