

Hypertension Control in Ambulatory Care Patients With Diabetes

Rhonda BeLue, PhD; Adetokunbo N. Oluwole, PhD; Arnold N. F. Degboe, MB, ChB, PhD;
and M. Kathleen Figaro, MD, MS

Type 2 diabetes mellitus (DM) is a major cause of morbidity and death, primarily through its microvascular and macrovascular complications.¹⁻⁴ The macrovascular complications are related to blood pressure (BP) and blood glucose control and include myocardial infarction (MI), lower extremity amputation, and stroke.²⁻⁴ While new data caution against excessive BP and glucose control in certain subpopulations,⁵⁻⁷ studies continue to suggest that appropriate lowering of BP in diabetes is important for improving macrovascular outcomes.⁴⁻⁷

Hypertension (HTN) is common among patients with diabetes. The prevalence ranges from 60% to 80% of patients, depending on the sample and the patient's race.⁸ The goal BP for those with type 2 DM is 130/80 mm Hg.⁸⁻¹⁰ Patients with diabetes whose systolic BP is 130 to 140 mm Hg are 46% less likely than those with uncontrolled systolic BP of over 140 mm Hg to die from any cause or suffer a nonfatal MI or stroke.^{4,6} The efficacy of HTN treatment for improving outcomes in type 2 DM is well documented by large trials showing benefits using both medications and lifestyle modifications.^{7,11} However, although HTN control among those with DM has improved over time, it is still less than ideal.¹²

Several clinical factors relate to unsatisfactory BP management of DM in the primary care setting, such as patient resistance to antihypertensive therapy, insufficient number of BP medications, side effects of medications, and provider clinical inertia. Racial and ethnic minorities, including blacks, Hispanics, and some Asian ethnic groups, are disproportionately affected by DM and are at increased risk for macrovascular complications.¹³⁻¹⁶ For example, black and Hispanic patients have a higher risk of stroke compared with white patients and benefit to the same extent as whites from use of medications to treat HTN.¹⁵⁻¹⁷

The goal of this study was to investigate HTN control among patients with diabetes in ambulatory care settings and to examine care setting characteristics, clinical variables, race, and sociodemographic status as they relate to HTN control among a national sample of patients with DM receiving care in diverse ambulatory care settings.

We hypothesized that patients with greater access to care as defined by treatment in private care settings would have a greater probability of achieving controlled BP. We also hypothesized that those who received

not only medication but also weight management counseling would have a greater probability of having controlled BP. Lastly, we hypothesized that a minority

Purpose: Hypertension (HTN) control among diabetics is essential to preventing macrovascular complications. We investigated correlates of HTN control among a national sample of 1313 patients with diabetes receiving care in ambulatory care settings.

Methods: The current study employed extant data from the 2008 National Ambulatory Care Survey. Multivariate logistic regression analyses were employed to examine the relationship between HTN control and candidate covariates, including race, income, provider, and facility characteristics, and patient demographic and health status indicators among patients with diabetes receiving care in ambulatory care facilities.

Results: Approximately 28.7% of patients achieved HTN control at the level of 130/80 mm Hg and 57.0% at 140/90 mm Hg. Patients seen at physician offices or academic medical center/hospital settings had greater probability of HTN control compared with outpatient departments and community health centers. Patients seen in academic medical centers or other hospital settings had the greatest probability of control (47.9% at 130/80 mm Hg and 70% at 140/90 mm Hg, $P < .0001$). Despite being more likely to be on antihypertensive medications, black patients with diabetes had the lowest probability of HTN control at the level of 140/90 mm Hg (41.1%) or 130/80 mm Hg (19.0%) compared with other race/ethnic groups ($P < .0001$).

Conclusions: Patients with diabetes seen in diverse primary care settings had a low probability of having blood pressure (BP) controlled to the recommended levels. Care setting-specific policies may prove useful in improving BP control. Continued attention is still warranted for racial and ethnic disparities in HTN control.

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In this article

Take-Away Points / p18
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For author information and disclosures,
see end of text.

Take-Away Points

- A majority of patients with diabetes seen in diverse primary care settings still do not have hypertension controlled to the more stringent requirements of the American Diabetes Association.
- This study highlights high-risk patient populations who have not achieved adequate blood pressure control.
- These results, especially the relatively low prevalence of blood pressure control among all patients being seen at multiple types of ambulatory care facilities, suggest that national policy changes for diabetes care should continue to focus on improving the quality of hypertension management in primary care settings, especially for high-risk patient populations.

of patients would have BP controlled to the American Diabetes Association (ADA) recommended level of 130/80 mm Hg and that underserved minority patients would be less likely to have that level of control compared with white patients.

METHODS

Study Population

This analysis uses extant data from the 2008 National Ambulatory Medical Care Survey and the National Hospital Ambulatory Medical Care survey (NAMCS/NHAMCS). The sampling framework is designed to obtain objective information about ambulatory medical care services in the United States. NAMCS data are collected based on a sample of visits to non-federally employed, office-based physicians who are primarily engaged in direct patient care. The NHAMCS consists of data on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments. This study only includes ambulatory care outpatient visits from the NHAMCS database.

Measures

Patient Sample: All patients in the sample were diagnosed with type 2 DM and HTN and were 30 years of age or older. Patients with DM were identified via *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* code (as indicated by the NAMCS/NHAMCS diagnosis variable) and/or by provider report on the patient intake form. Visits for diabetes were subset using the following: DM indicated as reason for visit, use of anti-diabetic agents, ICD-9-CM codes indicating DM, and provider indicating “yes” for a direct question asking whether patient has DM. The above approach minimized lost cases of DM. A total of 1313 patients with DM aged 30 years or older, with race/ethnicity categorized as white, black, Hispanic, or Asian, had a physician diagnosis or an ICD-9-CM code for HTN. Hypertension was identified using either reason for visit (HTN), use of anti-hypertensive drugs, ICD-9-CM codes indicating HTN, or direct indication of HTN as “yes” by provider.

Outcome of Interest: The ADA-recommended BP control goal of less than 130/80 mm Hg was used.⁸ Additionally, we assessed minimal BP standards at 140/90 mm Hg per treatment goals of the Seventh Joint National Committee (JNC 7) for patients without comorbidities, such as diabetes or chronic kidney disease. However, for patients with these comorbidities, the goal BP of <130/80 mm Hg is also recommended by JNC 7.⁹ Hypertension control

was categorized into “controlled” or “uncontrolled.” The controlled group had systolic BP <130 mm Hg and diastolic BP <80 mm Hg during the index visit. The uncontrolled group consisted of patients with DM with 1 or more of the following: systolic BP ≥130 mm Hg or diastolic BP ≥80 mm Hg.⁸ We also assessed minimal control at BP ≥140 mm Hg or diastolic BP ≥90 mm Hg.

Demographics: Patient demographic characteristics included patient age in years, gender, income (above and below the median income), and insurance status (private, Medicare, or other; other included no charge/charity, Medicaid, self-pay, unknown).

Ambulatory Care: Variables related to the ambulatory care setting and visit included receipt of weight management counseling (yes or no); provider care setting was categorized into 3 setting types including free-standing physician offices, hospital outpatient departments and community health centers, and finally academic medical centers and other hospital settings.

Comorbidity: We evaluated for the presence of hyperlipidemia (yes/no) and body mass index (BMI) as indicated on the NAMCS/NHAMCS patient intake form. Obesity was defined as BMI of 30 or higher.

Anti-Hypertensive Drugs: Patients were categorized as using anti-hypertensive drugs (yes versus no). Anti-hypertensive drugs were identified based on level 2 categories in Multum Lexicon Plus. The categories were 1) angiotensin-converting enzyme inhibitors, angiotensin II inhibitors, renin inhibitors, anti-adrenergic agents (peripheral and central acting), beta-adrenergic blocking agents, calcium channel blocking agents, diuretics, vasodilators, aldosterone receptor antagonists, and 2) anti-hypertensive combination drugs. Additionally, the number of anti-hypertensive drugs was also calculated.

Statistical Analysis

Analysis of variance and χ^2 tests were employed to examine the relationship between racial/ethnic group and HTN control, care setting characteristics, and patient characteris-

BP Control in Ambulatory Care Patients With Diabetes

Table 1. Weighted Percentages and Standard Error for Patient and Care Setting Characteristics by Race/Ethnic Group in 2008

Variable	All (N = 1313)	White (68.0%, n = 766)	Black (18.8%, n = 341)	Hispanic (10.2%, n = 165)	Asian (3.1%, n = 41)
Age mean (SE)^a	65.3 (0.45)	66.3 (0.7)	62.3 (1.5)	63.6 (1.9)	65.9 (3.9)
Gender					
Female	53.2 (2.4)	51.5 (2.9)	59.9 (4.4)	55.0 (5.6)	44.2 (8.0)
Male	46.8 (2.4)	48.5 (2.9)	40.1 (4.4)	45.0 (5.6)	55.8 (8.0)
Insurance status^a					
Private insurance	38.5 (2.6)	38.2 (2.9)	37.9 (5.8)	29.6 (6.5)	78.7 (11.6)
Medicare	50.6 (2.9)	53.5 (2.9)	44.0 (6.7)	53.6 (6.9)	15.2 (9.2)
Medicaid/self-pay/charity	10.9 (1.5)	8.3 (1.6)	18.1 (3.8)	16.8 (3.7)	6.1 (4.4)
Income^a					
Median 1 (≤\$40,627)	53.6 (4.2)	47.7 (5.0)	72.8 (5.2)	68.9 (7.7)	16.9 (11.0)
Median 2 (>\$40,627)	46.4 (4.2)	52.3 (5.0)	27.2 (5.2)	31.1 (7.7)	83.1 (11.0)
Mean BMI^a	32.7 (0.4)	32.9 (0.4)	33.4 (0.8)	31.4 (0.5)	27.3 (0.3)
Weight management counseling (P = .5636)	37.5 (3.0)	38.8 (3.6)	32.2 (5.7)	34.5 (8.6)	48.6 (9.1)
Hyperlipidemia (yes)^b	31.1 (2.5)	30.8 (3.2)	27.9 (4.8)	28.9 (4.6)	63.1 (4.0)
Clinical care setting^a					
Physician/group/HMO	72.7 (4.0)	72.9 (4.6)	68.9 (6.4)	79.0 (6.5)	78.3 (14.2)
Outpatient/community	13.6 (2.0)	10.0 (1.8)	24.3 (5.5)	18.6 (5.2)	14.1 (9.3)
Academic medical centers/ambulatory hospital settings	13.7 (3.5)	17.1 (4.3)	6.8 (2.9)	5.4 (3.2)	— (n=1)
Taking HTN drugs^c	63.7 (3.1)	60.2 (3.7)	72.0 (5.1)	73.7 (5.8)	55.8 (10.5)
BP control at 130/80^a	28.7 (1.7)	31.2 (1.9)	19.0 (3.1)	32.0 (4.2)	22.6 (5.7)
BP control at 140/90^a	57.0 (2.6)	61.7 (3.3)	41.1 (4.6)	52.9 (7.8)	67.5 (9.4)

BMI indicates body mass index; BP, blood pressure; HMO, health maintenance organization; HTN, hypertension; NS, non-significant; SE, standard error.
^a*P* < .0001.
^bBorderline significant, 0.1 < *P* < .05.
^c*P* < .05.
P values represent results from ANOVA (for age and BMI) or χ^2 tests for each variable by race/ethnicity.

tics. Binary logistic regression analyses were used to examine the relationship among outcome, HTN control, and candidate covariates, including race, income, provider, and facility characteristics controlling for patient demographic and health-status indicators. Regression analyses were run using Stata complex survey design procedures in order to obtain proper and robust standard errors. Variables not significant at *P* = .10 in bivariate regression were not entered into the final multivariable logistic regression model. Predicted probabilities were calculated using the Stata margins command. The predicted probability for the average marginal effect of each covariable on HTN control was estimated for each level of each covariable holding all other variables in the model at their means. *P* values reflect the statistical significance between each covariable and the probability of HTN control. Delta method standard errors were used to calculate confi-

dence intervals. Confidence intervals indicate the precision of the predicted probability estimate.

Given the known disparities in HTN control by race and ethnicity, analyses are presented for the overall sample and by race and ethnic group.

RESULTS

Overall, approximately 28.7% of patients achieved HTN control at the level of 130/80 mm Hg and 57.0% at 140/90 mm Hg. On average, patients in this study were obese with a BMI of 32.7. The average age was 65.3 years and 53% were female. About 38% of patients had private insurance while 50.6% had Medicare, and 10.9% had other forms of insurance or were self-pay; 72.7% of patients were cared for in private physician offices and 13.6% were in outpatient departments

■ **Table 2.** Weighted Percentages and Standard Errors of Patients Achieving HTN Control by Patient and Care Setting Characteristics

Variable	% HTN Control at 130/80 mm Hg Full Sample: 31.0%	% HTN Control at 140/90 mm Hg Full Sample: 57.4%
Mean age for HTN control (mean BMI [SE])^a		
HTN control: yes	66.9 (1.0)	66.5 (0.7)
HTN control: no	63.9 (0.9)	62.7 (1.0)
Gender^b		
Female	35.2 (4.5)	59.2 (3.0)
Male	25.3 (4.5)	54.4 (3.5)
Race/ethnicity^{c,d}		
White	34.3 (3.7)	61.7 (3.2)
Black	19.1 (3.0)	41.1 (4.6)
Hispanic	31.3 (2.7)	52.8 (7.8)
Asian	26.5 (1.7)	67.5 (9.4)
Income		
Median 1 (≤\$40,627)	30.5 (2.7)	47.2 (1.0)
Median 2 (>\$40,627)	30.0 (3.3)	50.1 (1.1)
Insurance status^{e,f}		
Private insurance	28.1 (3.6)	52.6 (4.3)
Medicare	36.2 (2.7)	65.6 (3.5)
Medicaid/self-pay/charity	18.5 (3.4)	37.7 (4.2)
Mean BMI for HTN control (mean age [SE])^a		
HTN control: yes	32.3 (0.7)	32.5 (0.4)
HTN control: no	32.9 (0.5)	33.1 (0.6)
Received weight management counseling		
Yes	32.4 (3.7)	58.9 (3.3)
No	27.5 (3.7)	53.9 (3.2)
Antihypertensive drug use		
Yes	28.4 (5.1)	52.2 (5.1)
No	31.8 (5.1)	59.6 (3.0)
Hyperlipidemia^{c,d}		
Yes	35.0 (4.1)	69.2 (4.0)
No	28.5 (4.1)	51.4 (2.9)
Clinical care setting^{c,d}		
Physician/group/HMO	28.4 (6.1)	56.5 (3.3)
Outpatient/community	24.4 (2.0)	46.4 (2.4)
Academic medical centers/ambulatory hospital settings	47.9 (6.0)	70.0 (4.8)

BMI indicates body mass index; HMO, health maintenance organization; HTN, hypertension; SE, standard error.

^aMean and standard deviation.

^b $P < .05$ (130/80 mm Hg).

^c $P < .0001$ (130/80 mm Hg).

^d $P < .0001$ (140/90 mm Hg).

^e $P < .01$ (130/80 mm Hg).

^f $P < .01$ (140/90 mm Hg).

or community healthcare centers, and 13.7% were cared for in academic medical centers or hospital settings (Table 1).

Patients seen in academic medical centers or other hospital settings had the greatest probability of HTN control (47.9% at 130/80 mm Hg and 70% at 140/90 mm Hg) compared with other outpatient settings. Patients with Medicare and private insurance had better control at both the 130/80 mm Hg and the 140/90 mm Hg levels, compared with patients on Medicaid, self-pay, or charity. In fact, Medicare patients had twice the probability of control compared with Medicaid, self-pay, or charity patients.

Women had greater probability of HTN control compared with men at recommended levels (35.2% vs 25.3%), but no gender differences were found at the 140/90 mm Hg level. Recorded weight management counseling was not related to HTN control. Black patients had the highest average BMI (approximately 33.4), which is indicative of obesity, but the lowest prevalence of hyperlipidemia (44%), compared with other race/ethnic groups. Asian patients with DM had lowest BMI (on average 27.3), indicative of overweight, yet the highest prevalence of hyperlipidemia (63.1%). Despite being more likely to be on antihypertensive medications, fewer black patients with DM had achieved HTN control at the level of 140/90 (41.1%) or 130/80 mm Hg (19.0%) compared with other race/ethnic groups (Table 2).

Non-black patients, those with hyperlipidemia, and those with Medicare insurance had the highest probability of control at the 140/90 mm Hg level. Individuals who sought care at academic medical centers or ambulatory hospital settings, women, and those with Medicare insurance had the highest probability of control at the 130/80 mm Hg level (see Table 3). Finally, to explore reasons for the relatively low predicted probability of HTN control among blacks, we investigated the interaction between race/ethnicity and insurance type, facility type, and income level. The race/ethnicity by insurance type interaction is significant and indicates that being underinsured may contribute to disparate HTN control among blacks ($P = .01$).

DISCUSSION

The majority of diabetes and HTN care is provided by primary care physicians in ambulatory care settings. Yet, primary care providers (PCPs) continue to report challenges, such as lack of time to provide the continuous patient care necessary to manage multiple chronic diseases.^{18,19} The acute complications of diabetes and related chronic symptoms, such as HTN, force PCPs to address fewer than 2 symptomatic problems per office visit rather than the more time-consuming management of multiple conditions.^{19,20} Studies also document that only

20% of PCPs feel they have resources necessary to manage patients effectively. Lifestyle behaviors, medication adherence, and dietary and exercise counseling are not always reviewed during PCP visits due to both perceived time constraints and the management of comorbid conditions.¹⁹

There continues to be a large proportion of hypertensive patients with DM with inadequate control of BP. We confirmed the importance of care setting as a measure of health-care access for control of BP.^{13,21,22} In this study, those who received care at hospital settings that included academic medical centers had a much higher probability of HTN control to the recommended level than those who received care at other settings. This result was independent of socioeconomic status and race. Possible reasons include greater awareness of guidelines by providers and patients alike, as well as other unmeasured differences in patient populations.

Black patients had a lower probability of controlled HTN in all care settings. Our results confirm the report of Safford and colleagues that black patients are more intensely treated with anti-hypertensive medications compared with white patients across all insurance status but still are more likely to have uncontrolled HTN.²⁰ Since so few black patients were controlled to the recommended level of 130/80 mm Hg, we were unable to evaluate sufficient numbers of black patients with better control in order to determine modifiable factors. Future studies with sufficient sample size should investigate which modifiable characteristics of black patients are associated with greater probability of control in order to point the way to potential interventions.

The data sets used for this study present some inherent limitations. First, the cross-sectional nature of the data limits our ability to infer causality between covariates of interest and HTN control. Secondly, sample sizes among some race/ethnic groups (Asian American) are small, and parameter estimates may not be completely stable. Given the relative paucity of cardiovascular risk information available among Asian populations, the small sample size is informative, but should be interpreted with caution. Furthermore, patient behaviors, such as diet, exercise, and medication adherence, are not available in this data set. Finally, while we found differences in HTN control by care setting, variety exists (eg, resources and patient characteristics) among places of care characterized as academic medical centers and community health centers.

While type of care is known to affect patient outcomes,^{13,21} further research is needed to expand on setting types, geographic variation, and patient outcomes.^{23,24} Our database did not include glycated hemoglobin measures; thus, we could not assess how well glucose itself was controlled and whether this related to BP control.

Table 3. Multivariable Logistic Regression Model and Predicated Probabilities of HTN Control for All Patient and Care Setting Characteristics

Variable	% HTN Control at 130/80 mm Hg Predicted Probability (CI)	% HTN Control at 140/90 mm Hg Predicted Probability (CI)
Gender^a		
Male (reference)	0.27 (0.22, 0.30)	0.54 (0.44, 0.63)
Female	0.37 (0.27, 0.39) ^a	0.59 (0.45, 0.69)
Race/ethnicity^{a,b}		
White (reference)	0.36 (0.24, 0.43)	0.59 (0.46, 0.69)
Black	0.18 (0.07, 0.28) ^a	0.38 (0.24, 0.52) ^b
Hispanic	0.34 (0.19, 0.48)	0.53 (0.36, 0.69)
Asian	0.36 (0.09, 0.52)	0.74 (0.45, 0.99)
Insurance status^{a,b}		
Private insurance (reference)	0.34 (0.22, 0.43)	0.55 (0.42, 0.67)
Medicare	0.40 (0.29, 0.48)	0.69 (0.56, 0.80)
Medicaid/self-pay/charity	0.23 (0.11, 0.32) ^a	0.43 (0.27, 0.54) ^b
Received weight management counseling (NS)		
Yes	0.34 (0.22, 0.42)	0.57 (0.38, 0.64)
No (reference)	0.30 (0.18, 0.37)	0.52 (0.44, 0.68)
Anti-hypertensive drug use (NS)		
Yes	0.28 (0.23, 0.33)	0.49 (0.42, 0.56)
No (reference)	0.35 (0.22, 0.45)	0.59 (0.42, 0.72)
Hyperlipidemia^c		
Yes	0.38 (0.28, 0.47)	0.73 (0.62, 0.82) ^c
No (reference)	0.32 (0.22, 0.40)	0.55 (0.42, 0.65)
Clinical care setting^a		
Physician/group/HMO (reference)	0.32 (0.22, 0.38)	0.56 (0.41, 0.66)
Outpatient/community	0.29 (0.31, 0.42)	0.54 (0.42, 0.66)
Academic medical centers/ambulatory hospital settings	0.49 (0.36, 0.61) ^a	0.65 (0.51, 0.78)

CI indicates confidence interval; HMO, health maintenance organization; NS, non-significant.

^a*P* < .01 (130/80 mm Hg).

^b*P* < .01 (140/90 mm Hg).

^c*P* < .05 (140/90 mm Hg).

Variables body mass index and income age were controlled for and were found to be multicollinear and/or insignificant at the *P* = .10 level and were subsequently removed.

In summary, an evaluation of a broad cross-section of patients with DM seen in diverse primary care settings demonstrates that a majority still do not have BP controlled to the requirements of the ADA or JNC 7. Just more than one-third of patients are controlled to a level of less than 130/80 mm Hg and less than two-thirds have achieved minimal control. These results, especially the relatively low prevalence of BP control among patients being seen in all types of clinical care settings, suggest that national policy changes for diabetes care should pay renewed attention to maintaining and improving quality of HTN management in primary care settings, especially for high-risk and underserved patients.

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Author Affiliations: From Health Policy and Administration (RB, ANO), The Pennsylvania State University, University Park, PA; School of Public Policy (ANFD), University of Kentucky, Lexington, KY; Division of Diabetes, Endocrinology and Metabolism (MKF), Vanderbilt University, Nashville, TN.

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Address correspondence to: Rhonda BeLue, PhD, The Pennsylvania State University, Health Policy and Administration, 604 Ford Building, University Park, PA 16802. E-mail: rzb10@psu.edu.

REFERENCES

- 1. The Diabetes Control and Complications Trial Research Group.** The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med.* 1993;329(14):977-986.
- 2. UK Prospective Diabetes Study (UKPDS) Group.** Tight blood pressure control and the risk of macrovascular and microvascular complications in type 2 diabetes (UKPDS 38). *BMJ.* 1998;317:703-713.
- 3. Schrier RW, Estacio RO, Esler A, et al.** Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int.* 2002;61:1086-1097.
- 4. Adler AI, Stratton IM, Neil HAW, et al.** Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. *BMJ.* 321: 412-419.
- 5. ADVANCE Collaborative Group; Patel A, MacMahon S, Chalmers J, Neal B.** Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. *N Engl J Med.* 2008;358(24):2560-2572.
- 6. Riddle MC.** Effects of intensive glucose lowering in the management of patients with type 2 diabetes mellitus in the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial. *Circulation.* 2010;122(8): 844-846.
- 7. The ACCORD Study Group; Cushman WC, Evans GW, Byington RP, et al.** Effects of intensive blood-pressure control in type 2 diabetes mellitus. *N Engl J Med.* 2010;362:1575-1585.
- 8. American Diabetes Association.** Standards of Medical Care in Diabetes—2011. *Diabetes Care.* 2011; 34(suppl 1):S11-S61; doi:10.2337/dc11-S011.
- 9. Chobanian AV, Bakris GL, Black HR, et al.** Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension.* 2003;42:1206-1252.
- 10. Buse JB, Ginsberg HN, Bakris GL, et al; for the American Heart Association and American Diabetes Association.** Primary prevention of cardiovascular diseases in people with diabetes mellitus: a scientific statement from the American Heart Association and the American Diabetes Association. *Circulation.* 2007;115:114-126.
- 11. ADVANCE Collaborative Group.** Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet.* 2007;370:829-840.
- 12. Sequist TD, Fitzmaurice GM, Marshall R, et al.** Physician performance and racial disparities in diabetes mellitus care. *Arch Intern Med.* 2008;168:1145-1151.
- 13. Link CL, McKinlay JB.** Disparities in the prevalence of diabetes: is it race/ethnicity or socioeconomic status? results from the Boston Area Community Health (BACH) survey. *Ethn Dis.* 2009;19(3):288-292.
- 14. Levine DA, Allison JJ, Cherrington A, Richman J, Scarinci IC, Houston TK.** Disparities in self-monitoring of blood glucose among low-income ethnic minority populations with diabetes, United States. *Ethn Dis.* 2009;19(2):97-103.
- 15. Morrissey NJ, Giacobelli J, Egorova N, et al.** Disparities in the treatment and outcomes of vascular disease in Hispanic patients. *J Vasc Surg.* 2007;46(5):971-978.
- 16. Kirk JK, Passmore LV, Bell RA, et al.** Disparities in A1C levels between Hispanic and non-Hispanic white adults with diabetes: a meta-analysis [published online ahead of print October 31, 2007]. *Diabetes Care.* 2008;31(2):240-246.
- 17. Umscheid CA, Gross R, Weiner MR, Hollenbeak CS, Tang SS, Turner BJ.** Racial disparities in hypertension control, but not treatment intensification. *Am J Hypertens.* 2009;23:54-61.
- 18. Phillips LS, Ziemer DC, Doyle JP, et al.** An endocrinologist-supported intervention aimed at providers improves diabetes management in a primary care site: improving primary care of African Americans with diabetes (IPCAAD) 7. *Diabetes Care.* 2005;28(10):2352-2360.
- 19. Spann SJ, Nutting PA, Galliher JM, et al.** Management of type 2 diabetes in the primary care setting: a practice-based research network study. *Ann Fam Med.* 2006;4(1):23-31.
- 20. Safford MM, Halanych JH, Lewis CE, Levine D, Houser S, Howard G.** Understanding racial disparities in hypertension control: intensity of hypertension medication treatment in the REGARDS study. *Ethn Dis.* 2007;17(3):421-426.
- 21. Cummings DM, Doherty L, Howard G, et al.** Blood pressure control in diabetes mellitus - temporal progress yet persistent racial disparities: national results from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study [published online ahead of print January 22, 2010]. *Diabetes Care.* 2010;33(4):798-803.
- 22. Fang J, Alderman MH, Keenan NL, Ayala C, Croft JB.** Hypertension control at physicians' offices in the United States [published online ahead of print January 10, 2008]. *Am J Hypertens.* 2008;21(2):136-142.
- 23. Kershaw KN, Diez Roux AV, Carnethon M, et al.** Geographic variation in hypertension prevalence among blacks and whites: the multi-ethnic study of atherosclerosis [published online ahead of print November 12, 2009]. *Am J Hypertens.* 2010;23(1):46-53.
- 24. Mujahid M, Diez Roux A, Morenoff J, et al.** Neighborhood characteristics and hypertension. *Epidemiology.* 2008;19:590-598. ■