# Patient Race/Ethnicity and Patient-Physician Race/Ethnicity Concordance in the Management of Cardiovascular Disease Risk Factors for Patients With Diabetes

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**OBJECTIVE** — Patient-physician race/ethnicity concordance can improve care for minority patients. However, its effect on cardiovascular disease (CVD) care and prevention is unknown. We examined associations of patient race/ethnicity and patient-physician race/ethnicity concordance on CVD risk factor levels and appropriate modification of treatment in response to high risk factor values (treatment intensification) in a large cohort of diabetic patients.

**RESEARCH DESIGN AND METHODS** — The study population included 108,555 adult diabetic patients in Kaiser Permanente Northern California in 2005. Probit models assessed the effect of patient race/ethnicity on risk factor control and treatment intensification after adjusting for patient and physician-level characteristics.

**RESULTS** — African American patients were less likely than whites to have A1C <8.0% (64 vs. 69%, $P < 0.0001$), LDL cholesterol <100 mg/dl (40 vs. 47%, $P < 0.0001$), and systolic blood pressure (SBP) <140 mmHg (70 vs. 78%, $P < 0.0001$). Hispanic patients were less likely than whites to have A1C <8% (62 vs. 69%, $P < 0.0001$). African American patients were less likely than whites to have A1C treatment intensification (73 vs. 77%, $P < 0.0001$; odds ratio [OR] 0.8 [95% CI 0.7–0.9]) but more likely to receive treatment intensification for SBP (78 vs. 71%, $P < 0.0001$; 1.5 [1.3–1.7]). Hispanic patients were more likely to have LDL cholesterol treatment intensification (47 vs. 45%, $P < 0.05$; 1.1 [1.0–1.2]). Patient-physician race/ethnicity concordance was not significantly associated with risk factor control or treatment intensification.

**CONCLUSIONS** — Patient race/ethnicity is associated with risk factor control and treatment intensification, but patient-physician race/ethnicity concordance was not. Further research should investigate other potential drivers of disparities in CVD care.

*Diabetes Care* 33:520–525, 2010

There are well-documented racial disparities in diabetes prevalence and mortality. African Americans and Hispanics have higher diabetes prevalence, death rates, and higher rates of serious complications (1). Even after controlling for access to care and socioeconomic status, diabetes disparities in the U.S. persist (1). There are also widely recognized disparities in cardiovascular risk factors associated with diabetes. African American and Hispanic patients with diabetes are less likely to meet glucose, cholesterol, or blood pressure targets (2).

The evidence surrounding whether insured patients of color receive worse care for diabetes and cardiovascular disease (CVD) risk factor control is mixed (3–6). Studies have found significant disparities in the likelihood of receipt of medications (7) and medication intensification (8,9). However, several studies have shown that minority patients received equal or better quality processes of care such as screening and medication intensification (4,10–12).

Interpersonal barriers resulting from language or cultural differences between patients and physicians may explain a portion of diabetes management disparities (13,14). Physicians engage in less patient-centered communication with patients of color than with white patients (15). Patient race/ethnicity has been associated with physicians' assessment of patient intelligence, feelings of affiliation toward the patient, and beliefs about the patients' likelihood of risk behavior and adherence with medical advice (16,17).

Patient-physician race/ethnicity concordance (the patient and health care provider having the same race/ethnicity) may help bridge interpersonal barriers in care for minority patients (18). Race/ethnicity concordance is associated with increased patient trust in the physician (19) and health services utilization and satisfaction (20). However, evidence that race/ethnicity concordance is an important factor in the quality of health care is mixed (21). No studies have examined the association among race/ethnicity concordance, cardiovascular disease processes of care, and levels of intermediate outcomes.

The purpose of this study was to examine the association of patient race/ethnicity and patient-physician race/ethnicity concordance on CVD risk factor levels and treatment intensification in a large cohort of diabetic patients in an integrated delivery system.

## RESEARCH DESIGN AND METHODS

— Study participants were members of the Kaiser Permanente Northern California (KPNC) Diabetes

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Received 22 April 2009 and accepted 1 December 2009. Published ahead of print at http://care.diabetesjournals.org on 15 December 2009. DOI: 10.2337/dc09-0760.
The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the funding organizations.
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Registry in 2005. KPNC provides comprehensive medical care to ~3.2 million members. Patients were selected for the study if they had diabetes before 1 January 2005 and were enrolled with an active drug benefit continuously throughout 2005. Eligible patients were further assessed for the presence of hypertension and hyperlipidemia using Kaiser Permanente automated clinical databases. Self-reported race/ethnicity data, obtained from Kaiser Permanente member surveys, study surveys, and hospitalization data, were available for 87.3% of patients. Physician data were obtained from physician demographic files maintained by The Permanente Medical Group.

The final study population consisted of 108,555 African American, white, and Hispanic adult diabetic patients and 1,750 physicians. Asian patients were not included in this analysis because, with current data limitations, ethnically dissimilar Asian patients and physicians would be considered race/ethnicity concordant, despite potentially significant cultural and language differences.

### Definition of dependent variables: good versus poor risk factor control

Three measures of risk factor control were used as dependent variables in this study. Good A1C risk factor control for diabetes was defined as a patient having an A1C laboratory value of <8.0% throughout 2005; this level is in accordance with quality guidelines at KPNC. Good risk factor control for patients with hypertension was defined as not having two or more consecutive systolic blood pressure (SBP) readings >140 mmHg at any time during the year. This level is higher than that in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (22) and KPNC guidelines for diabetic patients of SBP <130 mmHg but is a conservative target at which a diabetic patient most likely needs therapy modification. Good risk factor control for patients with hyperlipidemia was defined as an LDL cholesterol value <100 mg/dl during the year (23). Laboratory and blood pressure values for 2005 were obtained from automated KPNC databases.

### Treatment intensification

A binary variable was created to indicate whether pharmacy databases indicated an intensification of pharmacotherapy within 6 months after an instance of

**Table 1—*Patient descriptive statistics***

| | African American | Hispanic | White |
|---|---|---|---|
| *n* | 15,905 | 17,750 | 74,900 |
| Age (years) | | | |
| <50 | 18 | 22 | 13 |
| 51–64 | 42 | 37 | 37 |
| 65–74 | 27 | 27 | 29 |
| ≥75 | 14 | 14 | 22 |
| Sex | | | |
| Male | 45 | 50 | 53 |
| Female | 55 | 50 | 47 |
| Language | | | |
| English not primary language | 1 | 22 | 2 |
| Income | | | |
| <$30,000 | 15 | 10 | 6 |
| $30,000–$49,999 | 40 | 32 | 29 |
| $50,000–$64,999 | 21 | 26 | 25 |
| $65,000–$84,999 | 18 | 24 | 25 |
| ≥$85,000 | 6 | 8 | 15 |
| College degree | | | |
| <10% in census block | 36 | 36 | 20 |
| 10–20% | 33 | 35 | 34 |
| 20–30% | 21 | 20 | 28 |
| >30% | 10 | 8 | 18 |
| Doctor choice | | | |
| Assigned | 17 | 23 | 22 |
| Patient chose | 32 | 32 | 32 |
| Unknown | 50 | 44 | 46 |
| Physician specialty | | | |
| Internal medicine | 82 | 76 | 76 |
| Family practice | 11 | 16 | 17 |
| Other specialty | 7 | 8 | 7 |
| Physician race/ethnicity | | | |
| African American | 10 | 3 | 3 |
| Hispanic | 4 | 11 | 4 |
| White | 40 | 36 | 47 |
| Asian | 44 | 46 | 42 |
| Annual visits | | | |
| To own primary care provider | 2.4 | 2.4 | 2.4 |
| To any primary care provider | 3.6 | 3.5 | 3.4 |
| To any primary care provider/registered nurse | 4.6 | 4.3 | 4.3 |
| Years with own primary care provider | 6.3 | 5.6 | 6.0 |
| Insulin at baseline | 10 | 8 | 10 |
| Smoker | 16 | 11 | 13 |
| No. of drug classes | 8.3 | 7.4 | 8.2 |
| Medicare | 41 | 42 | 53 |
| Medications at baseline | | | |
| Diabetes medications | | | |
| Sulfonylureas | 39 | 43 | 38 |
| Metformin | 33 | 41 | 34 |
| Insulin | 12 | 11 | 12 |
| Hyperlipidemia | | | |
| Statins | 54 | 56 | 62 |
| Hypertension | | | |
| ACE inhibitors | 48 | 49 | 51 |
| β-Adrenergic blockers | 32 | 28 | 36 |
| Thiazides/related diuretics | 36 | 24 | 27 |
| Calcium channel blockers | 30 | 16 | 18 |

Data are percent.

**Table 2—*Percentage of patients with good CVD risk factor control by race/ethnicity***

| | African American patients | | | Hispanic patients | | | White patients | | |
|---|---|---|---|---|---|---|---|---|---|
| | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) |
| A1C <8% | 65 | 64 ± 0.6* | 0.76 (0.71–0.81) | 63 | 62 (0.7)* | 0.69 (0.71–0.81) | 74 | 69 | Ref |
| LDL cholesterol <100 mg/dl | 41 | 40 ± 0.8* | 0.71 (0.66–0.76) | 47 | 49 (0.7)† | 1.09 (1.02–1.16) | 50 | 47 | Ref |
| SBP <140 mmHg | 70 | 70 ± 0.6* | 0.62 (0.58–0.67) | 77 | 77 (0.6) | 0.95 (0.87–1.03) | 78 | 78 | Ref |

Data are %, % ± SEM, or ORs (95% CI). Physician random effect probit models and logistic regression models were adjusted for patient age, sex, preferred language, number of comorbidities, number of primary care visits in 2005, Medicare status, number of medication classes taken for condition, pill burden, geocoded education and income, physician age, sex, race/ethnicity, language, panel size, and number of diabetic patients in panel. White patients are the referent (Ref) group. *$P < 0.001$; †$P < 0.05$.

poor risk factor control during 2005. A 6-month period (as used in previous studies [4]) was chosen because the high visit rate of diabetic patients within KPNC and the use of primary care teams who can reach out to initiate therapy modification on the physician's behalf via phone or mail give sufficient opportunity for therapy modification in this setting. Intensification was defined as an increase in the number of drug classes, an increase in dosage of at least one drug class, or a switch to a different drug class within 6 months. Daily doses were categorized as low (near initial starting doses), medium (maintenance range), or high (high end or above maintenance range) based on package insert recommendations and inspection of actual dosage distributions. Patients who were already using insulin were excluded from the treatment intensification for hyperglycemia analysis because treatment intensification for insulin cannot be measured in automated pharmacy databases.

## Main explanatory variables

**Patient race/ethnicity.** Patient race/ethnicity was the main explanatory variable for multivariable models that assessed predictors of risk factor control and treatment intensification. In these stratified (African American versus white and Hispanic versus white) models, separate dummy variables were created for African American and Hispanic race/ethnicity, with white patients as the reference group. Similar dummy variables were created for African American and Hispanic physicians, with white physicians as the reference group.

**Patient-physician concordance.** Patient-physician interaction terms were included to assess the association of patient-physician race/ethnicity concordance with risk factor control and treatment intensification for African American and Hispanic patients.

## Multivariate analyses

Stratified probit models assessed the marginal effect of patient race/ethnicity and patient-physician concordance on A1C, LDL cholesterol, and SBP control and intensification. The resulting marginal effects were converted into adjusted percentages of patients in good CVD risk factor control and patients at above-target CVD risk factor levels who received treatment intensification. These models controlled for patient age, sex, preferred language, number of comorbidities, risk factor values (for treatment intensification analysis), number of primary care visits in 2005, Medicare status, number of medication classes taken for condition, overall pill burden, geocoded education, and income as fixed effects. Physician age, sex, race/ethnicity, language proficiency (which is self-reported by physicians at their onset of employment with the medical group), panel size, and number of diabetic patients in panel were also included as fixed effects. To account for patient clustering at the physician level, all models adjusted for physician as a random effect. Logistic regression models were also run to confirm the multivariate findings.

This study was developed and approved by the Steering Committee of the Translating Research in Action for Diabetes (TRIAD) study and approved by the KPNC Institutional Review Board. All

**Table 3—*Percentage of patients with good CVD risk factor control by race/ethnicity concordance***

| | African American patients | | | Hispanic patients | | |
|---|---|---|---|---|---|---|
| | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) |
| A1C <8% | | | | | | |
| Concordant | 66 | 65 ± 1.7 | 1.07 (0.89–1.28) | 62 | 63 ± 1.5 | 0.94 (0.81–1.10) |
| Discordant | 65 | 64 | Ref | 63 | 62 | Ref |
| LDL cholesterol <100 mg/dl | | | | | | |
| Concordant | 38 | 40 ± 2.1 | 0.96 (0.79–1.16) | 49 | 48 ± 1.7 | 0.93 (0.79–1.08) |
| Discordant | 42 | 40 | Ref | 48 | 49 | Ref |
| SBP <140 mmHg | | | | | | |
| Concordant | 68 | 69 ± 1.6 | 0.95 (0.78–1.16) | 76 | 76 ± 1.4 | 0.93 (0.78–1.12) |
| Discordant | 70 | 70 | Ref | 77 | 77 | Ref |

Data are %, % ± SEM, and ORs (95% CI). Probit random effect and logistic models examined minority patient-physician race/ethnicity interactions. Models were adjusted for patient age, sex, preferred language, number of comorbidities, number of primary care visits in 2005, Medicare status, number of medication classes taken for condition, pill burden, geocoded education and income, physician age, sex, race/ethnicity, language, panel size, and number of diabetic patients in panel. Race/ethnicity discordant patients are the referent (Ref) group.

**Table 4—*Percentage of patients receiving treatment intensification (among patients with elevated risk factor values) by patient race/ethnicity***

| | African American patients | | | Hispanic patients | | | White patients | | |
|---|---|---|---|---|---|---|---|---|---|
| | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) |
| A1C <8% | 76 | 73 ± 1.2* | 0.82 (0.71–0.94) | 77 | 75 ± 1.1 | 0.92 (0.80–1.05) | 78 | 77 | Ref |
| LDL cholesterol <100 mg/dl | 44 | 44 ± 1.0 | 0.96 (0.87–1.04) | 47 | 47 ± 1.1† | 1.1 (1.0–1.2) | 43 | 45 | Ref |
| SBP <140 mmHg | 70 | 78 ± 1.3‡ | 1.47 (1.28–1.68) | 77 | 74 ± 1.5 | 1.1 (0.98–1.33) | 78 | 71 | Ref |

Data are %, % ± SEM, and ORs (95% CI). Physician random effect probit and logistic regression models were adjusted for patient age, sex, preferred language, number of comorbidities, number of primary care visits in 2005, Medicare status, number of medication classes taken for condition, laboratory values, pill burden, geocoded education and income, physician age, sex, race/ethnicity, language, panel size, and number of diabetic patients in panel. White patients are the referent (Ref) group.*$P < 0.01$; †$P < 0.05$; ‡$P < 0.001$.

analyses were performed using STATA (version 10).

**RESULTS** — Approximately half of the patients in the sample were male (52%) and almost 97% reported speaking at least some English. Almost half of the patients (46%) were white, 11% were Hispanic, and 10% were African American. Spanish was the primary language of almost a quarter (22%) of the Hispanic patients. Only 10% of African American and 11% of Hispanic patients were in race/ethnicity concordant relationships with their providers. Physicians were disproportionately white (47%) or Asian (40%); <8% of physicians were either African American or Hispanic. Patients were with their primary care physicians for an average of 5.6–6.3 years (Table 1).

After controlling for patient and physician characteristics, patient race/ethnicity was a significant predictor of risk factor control for all three risk factors (Table 2). African American patients were less likely than whites to have A1C <8% (64 vs. 69%, $P < 0.001$). African American patients were also less likely to be at or below target LDL cholesterol (40 vs. 47%, $P < 0.001$) and SBP (70 vs. 78%, $P < 0.001$). Hispanic patients were less likely than whites to have A1C <8% (62 vs. 69%, $P < 0.001$). Risk factor control varied little and nonsignificantly by patient-provider race/ethnicity concordance (Table 3).

Table 4 shows the proportion of patients at above-target risk factor levels who received treatment intensification within 6 months, by race/ethnicity, after adjustment for patient and physician characteristics. Patient race/ethnicity was a significant predictor of treatment intensification for all three risk factors. African American patients were less likely than white patients to have A1C intensification (73 vs. 77%, $P < 0.0001$) and more likely to receive treatment intensification for SBP above target (78 vs. 71%, $P < 0.0001$). No significant differences in A1C or SBP intensification were found for Hispanic patients compared with white patients. However, Hispanic patients were more likely than white patients to have treatment intensification for LDL cholesterol (47 vs. 45%, $P < 0.05$). Treatment intensification was not significantly associated with patient-physician race/ethnicity concordance (Table 5). Race/ethnicity and race/ethnicity concordance effects on risk factor control and treatment intensification were consistent regardless of whether the patient's preferred language was included in the model, when cut points of A1C <7% and SBP <130 mmHg were used, and when insulin use was adjusted for in models of treatment intensification for hyperglycemia (data not shown).

**CONCLUSIONS** — Our findings are consistent with previous research showing racial disparities in CVD risk factor control (2). African American patients had worse risk factor control for A1C, LDL cholesterol, and SBP than white patients. Hispanic patients had worse control for A1C than white patients. Unlike previous research, after controlling for patient and physician characteristics, Hispanic patients were no more likely to have

**Table 5—*Percentage of patients receiving treatment intensification by patient-physician race/ethnicity concordance***

| | African American patients | | | Hispanic patients | | |
|---|---|---|---|---|---|---|
| | Unadjusted | Adjusted | OR (95% CI) | Unadjusted | Adjusted | OR (95% CI) |
| A1C <8% | | | | | | |
| Concordant | 72 | 73 ± 3.1 | 0.99 (0.69–1.43) | 77 | 75 ± 2.7 | 1.04 (0.76–1.43) |
| Discordant | 77 | 74 | Ref | 77 | 75 | Ref |
| LDL cholesterol <100 mg/dl | | | | | | |
| Concordant | 44 | 46 ± 2.6 | 1.08 (0.85–1.37) | 48 | 46 ± 2.4 | 0.95 (0.77–1.16) |
| Discordant | 44 | 44 | Ref | 47 | 47 | Ref |
| SBP <140 mmHg | | | | | | |
| Concordant | 69 | 76 ± 3.5 | 0.87 (0.62–1.23) | 75 | 80 ± 3.4 | 1.35 (0.95–1.90) |
| Discordant | 75 | 78 | Ref | 73 | 74 | Ref |

Data are %, % ± SEM, and ORs (95% CI). Probit random effects and logistic model examined minority patient-physician race/ethnicity interactions. The model was adjusted for patient age, sex, preferred language, number of comorbidities, number of primary care visits in 2005, Medicare status, number of medication classes taken for condition, pill burden, geocoded education and income, physician age, sex, race/ethnicity, language, panel size, and number of diabetic patients in panel. Race/ethnicity discordant patients are the referent (Ref) group.

poor risk factor control for LDL cholesterol and SBP than white patients (3).

Our findings also provide evidence supporting the hypothesis that race/ethnicity is modestly associated with treatment intensification. We found disparities in A1C intensification in comparisons of African American patients with white patients. We also found that, in some cases, minority patients were more likely to receive treatment intensification than whites. One potential explanation for the greater likelihood of treatment intensification for African American patients with elevated SBP and Hispanics with elevated LDL cholesterol compared with whites is what is known as the statistical discrimination hypothesis: in instances of uncertainty, physicians may rely on what they know about the prevalence and consequences of the disease for the racial group to which a particular patient belongs (24). Aware of high rates of hypertension in African American patients and high cholesterol in Hispanic patients, physicians may be more likely to intensify treatment.

Patient preferences may also drive differences in treatment intensification by race/ethnicity. Studies have shown differential trust in the medical system for minority patients. Minority patients are more likely than whites to perceive they would have received better medical care if they belonged to a different racial and ethnic group and that medical staff judged them unfairly or treated them with disrespect based on race/ethnicity (25). These barriers to trust may affect patients' attitudes toward medicine and may contribute to differential reluctance to intensify therapy. On the other hand, it is also possible that African American patients may be more anxious about elevated SBP than white patients are.

Our findings do not support the hypothesis that patient-physician race/ethnicity concordance would improve control of intermediate diabetes outcomes. Previous research has shown that equal or better care for minority patients does not necessarily close gaps in health outcomes between minority and white patients (13), so it is quite possible that potential benefits of concordance would not translate into (immediate) intermediate outcome improvement.

Several limitations to this study should be noted. Patients and physicians were from a single large, integrated health care delivery system; it is possible that patients and physicians in this setting may be different from patients and physicians in other settings. However, the patient and physician populations studied were fairly diverse, and the delivery system population is demographically similar to the region it serves (3). Omitted variables, such as patient family history of stroke, evidence of end-organ damage, and patient and physician attitudes and beliefs regarding medication, were not captured in these analyses and may influence differential intensification rates. Our variables were also limited by the fact that we only had access to socioeconomic status indicators from geocoding; individual-level data on education and income were not available in this study. Another limitation is that we were unable to assess treatment intensification for A1C control in patients who were already taking insulin at the start of the study; it is possible that this causes underestimation of the level of intensification in this population and potentially biases differences in intensification rates for hyperglycemia by race/ethnicity. We were also unable to measure nonmedication treatment decisions physicians make; in response to poor control, physicians may provide diet, exercise, and other lifestyle recommendations that we are unable to include in our analysis.

Another limitation of the study was our inability to assess the impact of race/ethnicity and race/ethnicity concordance on risk factor control and treatment intensification for Asians and patients and physicians of other races/ethnicities. Future research exploring ethnic and language concordance in these populations is indicated.

Finally, another potential reason we did not detect significant race/ethnicity interaction effects is that many diabetic patients also receive care from nutritionists, health educators, and pharmacists and potentially from other physicians and nurses. For example, patients may also have access to diabetes care classes provided by health educators. We were unable to assess patient race/ethnicity concordance with these and other medical care staff, and these relationships may have played a role in predicting risk factor control and intensification.

In summary, in this study, minority race/ethnicity was a significant predictor of worse patient risk factor control and better treatment intensification. However, patient-physician race/ethnicity concordance was not associated with either control or treatment intensification for any risk factor. Future researchers should try to illuminate the specific barriers to intensification, including possible patient or physician cultural factors that would inform targeted interventions to improve both risk factor control and treatment intensification.

**Acknowledgments**— This study was jointly funded by Program Announcement 04005 from the Centers for Disease Control and Prevention (Division of Diabetes Translation) and the National Institute of Diabetes and Digestive and Kidney Diseases. Support was also provided by the Agency for Healthcare Research and Quality (R01-HS-013902-01) and the National Institute on Aging (NIA) (R01-AG-029316-01). J.A.S. was supported by the Office of Research in Women's Health Building Interdisciplinary Careers in Women's Health K12 Career Development Award (K12HD052163). C.M.M. was partially supported by the UCLA Resource Center for Minority Aging Research (NIA Grant 2P30-AG-021684-06) and by the UCLA/Drew Project EXPORT, National Institutes of Health, National Center on Minority Health and Health Disparities (P20-MD-000148/P20-MD-000182).

No potential conflicts of interest relevant to this article were reported.

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