Influence of Patient Race on Physician Prescribing Decisions: A Randomized On-Line Experiment

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BACKGROUND: Prior research reports black patients have lower medication use for hypercholesterolemia, hypertension, and diabetes.

OBJECTIVE: To assess whether patient race influences physicians' prescribing.

DESIGN: Web-based survey including three clinical vignettes (hypercholesterolemia, hypertension, diabetes), with patient race (black, white) randomized across vignettes.

SUBJECTS: A total of 716 respondents from 5,141 eligible sampled primary care physicians (14% response rate).

INTERVENTIONS: None

MEASUREMENTS: Medication recommendation (any medication vs none, on-patent branded vs generic, and therapeutic class) and physicians' treatment adherence forecast (10-point Likert scale, 1—definitely not adhere, 10—definitely adhere).

RESULTS: Respondents randomized to view black patients (n=371) and white patients (n=345) recommend any medications at comparable rates for hypercholesterolemia (100.0% white vs 99.5% black, $P=0.50$), hypertension (99.7% white vs 99.5% black, $P=1.00$), and diabetes (99.7% white vs 99.7% black, $P=1.00$). Patient race influenced medication class chosen in the hypertension vignette; respondents randomized to view black patients recommended calcium channel blockers more often (20.8% black vs 3.2% white) and angiotensin-converting enzyme inhibitors less often (47.4% black vs 62.6% white) ($P<0.001$). Patient race did not influence medication class for hypercholesterolemia or diabetes. Respondents randomized to view black patients reported lower forecasted patient adherence for hypertension ($P<0.001$, mean: 7.3 black vs 7.7 white) and diabetes ($P=0.05$ mean: 7.4 black vs 7.6 white), but race had no meaningful influence on forecasted adherence for hypercholesterolemia ($P=0.15$, mean: 7.2 black vs 7.3 white).

CONCLUSION: Racial differences in outpatient prescribing patterns for hypertension, hypercholesterolemia, and diabetes are likely attributable to factors other than prescribing decisions based on patient race.

KEY WORDS: patient race; prescription medication; hypertension; hypercholesterolemia; diabetes.

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Previous studies of the management of hypertension, hypercholesterolemia, and diabetes in the ambulatory setting have identified a pattern of poorer quality of care for black patients compared with white patients.^{1–5} Historically, black patients have had lower rates of assessment and control of hemoglobin A1c,^{3–5} low-density lipoprotein cholesterol,^{2,4,5} and blood pressure^{3,4} in addition to lower rates of associated medication use.^{2,4,5} These quality differences may reflect differences in factors at the patient level (e.g., black patients may have higher co-pay burdens),⁶ the physician level (e.g., physicians who treat most black patients have worse access to medical resources), or both.⁷ In particular, reports of disparities in processes of care have led to concerns that patient race may directly influence physicians' decisions in the management of these conditions.⁸ Our primary aim in this study was to assess whether physician prescribing recommendations for these conditions vary by patient race.

Demonstrating that patient race directly influences physicians' prescribing recommendations is difficult. Other factors associated with, but distinct from, patient race (e.g., socioeconomic status) may also contribute to racial variations in the treatment provided to patients.⁹ Observational studies of racial variations in treatment are necessarily constrained by the data they collect, and, despite rigorous statistical techniques, cannot account for all factors that may influence patient treatment. In contrast, a controlled experiment in which physicians are randomized to treating patients of different races while other factors are held constant provides one means for gauging the direct effect of patient race on treatment recommendations.¹⁰

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To assess the effect of patient race on prescribing decisions in the primary care setting, we conducted a controlled experiment of physicians' medication recommendations for patients presenting with hypertension, hypercholesterolemia, and diabetes mellitus. Based on previous reports of racial differences in patient care,¹⁻⁵ we hypothesized that patient race would influence physician prescribing decisions. Specifically, we anticipated that physicians randomized to view black patients would recommend treatment less frequently than physicians randomized to view otherwise identical white patients, differ in the class of medications they recommended, and be less likely to recommend on-patent brand-name medications.

METHODS

Study Sample

The sampling strategy is described in greater detail elsewhere.¹¹ Briefly, physicians were recruited for a web-based survey as part of a study of the impact of Medicare Part D on physicians' prescription preferences. Eligible physicians were selected from primary care physicians practicing in four large, racially-diverse states (Florida, Massachusetts, North Carolina, and Texas). To ensure physicians had sufficient experience in the primary care management of the three medical conditions presented in the clinical vignettes, we identified eligible subjects using physician-level prescribing data obtained from Wolters Kluwer Health, a pharmaceutical market research company. The sampling frame consisted of physicians whose patients had filled a minimum of 30 new (non-refill) prescriptions, including five by Medicaid patients, for each of hypercholesterolemia, hypertension, and diabetes in the year preceding the study (September 2006 to August 2007). Respondents were ineligible for the survey if they reported being enrolled in or having completed a clinical fellowship, practicing as a hospitalist, or not treating both Medicaid and Medicare patients in the last 2 months.

Survey Instrument

We collected detailed information regarding physician-level characteristics (race, sex, medical specialty, board certification, international medical graduate status, years in practice, and time spent on clinical medicine), and practice-level characteristics (number of physicians in the practice, and the income level, race/ethnicity and insurance status of patients in the practice).

Respondents viewed three clinical vignettes describing patients presenting with hypercholesterolemia, hypertension, and diabetes, respectively. Vignettes provide a robust means of assessing respondents' reactions to selected patient attributes by systematically varying features of the presented information, while minimizing concerns of social desirability bias.^{12,13} In each vignette, respondents were provided with a standardized text consisting of the hypothetical patient's medical history, list of relevant current medications, and findings from an exam during the current visit (Text Box). A photo of a patient accompanied each vignette (Fig. 1). The photos, previously utilized in a study of physician decision-making,¹⁰ were of actors dressed in identical patient gowns and photo-

graphed in a similar manner. To minimize order effects, the vignettes were shown in random order.

To assess the impact of race on treatment recommendations, respondents were randomized to view photos of black patients or white patients. Patient race was disclosed solely via the patient photos, as demonstrated on a sample screen from the survey (Fig. 2). We also randomized information regarding patients' historical adherence to treatment (three levels: no information, low historical adherence, high historical adherence) and prescription drug insurance source (four levels: Medicare, Medicaid, Medicare-Medicaid dual eligible, commercial), because these were factors of interest in other analyses. Patient race, historical adherence, and prescription drug insurance source were constant across the three vignettes shown to each respondent. Patient sex was fixed by vignette; the hypercholesterolemia and hypertension vignettes described male patients in the text and photos, and the diabetes vignette described a female patient. Patient age was fixed as a function of insurance status. Medicare and dual eligible patients were 66 years old, while Medicaid and commercial insurance patients were 63 years old. Other than patient sex, historical adherence, age, and prescription drug insurance source, all information in the vignette text presentation was identical across respondents.

After each vignette, respondents were asked whether they would recommend a new medication and if so which medication they would recommend for the specific condition described in the vignette. Respondents could recommend no new medication, select a medication from a drop-down menu organized by therapeutic class, or write-in a medication recommendation. To minimize order effects, drugs were displayed in random order by therapeutic class.

As an additional test of their sensitivity to the race of the hypothetical patients in the vignettes, respondents were asked about their perceptions of the patients' adherence. Respondents who recommended a new medication were asked to predict the likelihood that the hypothetical patient would comply with their prescribed treatment recommendation using a 10-point Likert scale (1, the patient would definitely not comply; 10, the patient would definitely comply). They were also asked to rate their confidence in their adherence forecast using a 5-point Likert scale (1, not at all confident; 5, extremely confident).

The survey instrument (copy available upon request) was pilot-tested extensively for clarity and breadth. The final version of the fielded instrument required, on average, 22 min to complete and was administered via a dedicated website.

Survey Administration

We identified 5,901 physicians in the sampling frame described above. Sampled physicians were contacted by first-class mail in one of four overlapping waves between November 2007 and March 2008. The invitation letter directed respondents to the survey website and offered an honorarium ranging from \$50 to \$100 for their participation. Non-respondents with valid mailing addresses were contacted with up to three postcard reminders mailed at 1-month intervals.

Of the 5,901 eligible physicians, 760 were ineligible for the study based on incorrect mailing addresses or other study eligibility criteria. Of the remaining 5,141 contacted, 716 completed the survey, for an overall response rate of 14%.

Text employed in the clinical vignettes. For the purposes of illustration, the patient in each vignette is described as 63 years old, historically non-compliant with treatment, and has prescription drug coverage via Medicaid.

Hypercholesterolemia Vignette

Suppose that you are seeing this 63 year-old patient who has a history of hypertension, obesity, tobacco use, and hypercholesterolemia. He currently takes a thiazide diuretic and low-dose aspirin. His most recent blood pressure is 134/84, and a recent fasting lipid panel indicates total cholesterol of 230, an HDL of 50, triglycerides of 120, and an LDL of 190. The patient has attempted diet and exercise for several months, but largely been non-compliant. Given his risk factors for heart disease, you and the patient discuss various treatment options for his high cholesterol. The patient has prescription coverage through Medicaid.

Of course, if this were your patient, you would want more information than can be provided here. However, assume that you had just the information above and were considering pharmacologic treatment for his high cholesterol. Which one of the following options would you suggest?

Hypertension Vignette

Suppose that you are seeing this 63 year-old patient with hypertension. Despite his efforts at dietary modification and increased physical activity, his blood pressure remains high. Today, his blood pressure is 158/96, a level similar to his previous clinic visits. Current medications include a low-dose aspirin and maximum-dose thiazide diuretic. The patient has attempted diet, exercise, and drug therapy for several months, but largely been non-compliant. Given his risk factors for heart disease, you and the patient discuss various treatment options for his hypertension. The patient has prescription coverage through Medicaid.

Of course, if this were your patient, you would want more information than can be provided here. However, assume that you had just the information above and were considering pharmacologic treatment for his hypertension. Which one of the following options would you suggest?

Diabetes Vignette

Suppose that you are seeing this 63 year-old patient with hypertension and previously diet-controlled diabetes. Despite her efforts at continued dietary modification and increased physical activity, her blood sugars remain high and a recent Hgb A1C is 8.9. Current medications include a low-dose aspirin, a thiazide diuretic, and an ACE-inhibitor. The patient has attempted diet and exercise for several months, but largely been non-compliant. Given her risk for diabetic complications, you and the patient discuss various treatment options for her diabetes. The patient has prescription coverage through Medicaid.

Of course, if this were your patient, you would want more information than can be provided here. However, assume that you had just the information above and were considering pharmacologic treatment for her diabetes. Which one of the following options would you suggest?

Text Box.

Statistical Analysis

We used t-tests and chi-square analyses to compare characteristics of respondents randomized to view vignettes using photographs of black patients with characteristics of respondents randomized to view vignettes using photographs of white patients.

We assessed the impact of patient race on physician medication recommendations for each vignette by comparing the proportion of respondents who recommended additional treatment between those randomized to view black patients and those randomized to white patients using two-sided Fisher exact tests. We also compared the distribution of recommended agents in each vignette by drug class and patent status using chi-square tests to assess whether patient race influenced the type of agent recommended.

To assess whether patient race influenced physicians' expectations of patient adherence with new medications, we compared distributions of adherence forecasts and levels of physician confidence in their forecasts of adherence using Wilcoxon rank-sum tests.

We conducted pre-specified two-way interaction tests to assess whether the effect of patient race differed by respondents' state of

practice or level of reported patient adherence information. Specifically, we used Cochran-Mantel-Haenszel tests to assess whether the proportions of respondents recommending any additional treatment and recommending use of an on-patent branded treatment differed by patient race when stratified by these factors. Similarly, we used likelihood ratio tests in an ordered logistic regression framework to assess whether racial differences in respondents' forecasts of patient adherence and their confidence in those forecasts varied by respondent's state and reported patient adherence information.

We analyzed pooled, de-identified data to ensure respondents' confidentiality. Statistical analyses were conducted using SAS 9.1.3 (SAS Institute Inc., Cary, NC) and Stata 9.2 (Stata Corporation, College Station, TX) software. The study was approved by the Arizona State University Institutional Review Board.

RESULTS

Respondents randomized to view vignettes with photos of black patients comprised a larger proportion of physicians practicing in North Carolina and a smaller proportion practicing in Florida relative to respondents randomized to view

Figure 1. Patient actor photos. Photos of patient actors utilized in the study. Respondents were randomized to view black patient actors (images A, B, and C) or white patient actors (images D, E, and F) for all three vignettes. Used, with permission, from Schulman KA, NEJM 1999.

vignettes with photos of white patients. Respondents randomized to view black patients had a marginally larger proportion of female respondents and fewer years of practice compared with respondents randomized to view white patients. Respondents randomized to view black patients and white patients did not statistically differ for any other characteristics (Table 1).

Patient race did not influence the decision to prescribe a new medication, as virtually all respondents recommended new medications in the hypercholesterolemia (100.0% white vs 99.5% black, $P=0.50$), hypertension (99.7% white vs 99.5% black, $P=1.00$), and diabetes (99.7% white vs 99.7% black, $P=1.00$) vignettes (Table 2). These findings were unchanged when stratified by respondents' state of practice and level of adherence information ($P>0.20$ for all interactions, results not shown).

Patient race influenced choice of agent in the hypertension vignette. Respondents randomized to view black patients recommended calcium channel blockers more often (20.8% black vs 3.2% white) and angiotensin-converting enzyme (ACE) inhibitors less often (47.4% black vs 62.6% white) than respondents randomized to view white patients ($P<0.001$ for comparisons). There were no differences in class of medication recommended by respondents randomized to view black patients and respondents randomized to view white patients in the hypercholesterolemia ($P=0.88$) and diabetes vignettes ($P=0.38$) (Table 2).

Patient race did not influence the likelihood of recommending on-patent branded agents (versus generic agents) overall; respondents randomized to view black patients recommended branded agents at a comparable frequency as respondents randomized to view white patients in the hypercholesterolemia ($P=0.20$), hyper-

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Now we would like you to read three brief clinical vignettes and answer questions about each one.

Please keep in mind that physicians vary in their practice styles and there are no right or wrong answers to these hypothetical vignettes.

Vignette 1

Suppose that you are seeing this 63 year-old patient with hypertension and previously diet-controlled diabetes. Despite her efforts at continued dietary modification and increased physical activity, her blood sugars remain high and a recent Hgb A1C is 8.9. Current medications include a low-dose aspirin, a thiazide diuretic, and an ACE-inhibitor. The patient has attempted diet and exercise for several months, but been largely non-compliant. Given her risk for diabetic complications, you and the patient discuss various treatment options for her diabetes. The patient has prescription coverage through Medicaid.

Of course, if this were your patient, you would want more information than can be provided here. However, assume that you had just the information above and were considering pharmacologic treatment for her diabetes.

Which one of the following options would you be most likely to suggest?

If you select a drug class, you will be shown a list of the drugs within that class, including, for each drug, information on the patient's copayment and an indication of whether you must obtain a prior authorization before the prescription can be filled. You may return to this page without selecting a drug.

- ☐ Dipeptidyl peptidase-4 inhibitor
- ☐ Sulfonylurea
- ☐ Meglitinide
- ☐ Glucagon-like peptide-1 analog
- ☐ Glitazone
- ☐ Alpha-glucosidase inhibitor
- ☐ Biguanide
- ☐ Other drug. Please specify:
- ☐ Would prescribe no additional medications

Done

Figure 2. Sample vignette screen. Screen displaying vignette, treatment choices, and patient actor.

tension ($P=0.92$), and diabetes vignettes ($P=0.80$) (Table 2). Pre-specified interaction tests found that racial differences in the likelihood of recommending a branded agent in the hypercholesterolemia vignette differed by reported adherence information. Respondents randomized to view black patients were more likely to recommend a branded agent than respondents randomized to view white patients when no adherence information was provided (52.9% black vs 35.2% white), but had comparable rates when patients were characterized as low adherence (42.5% black vs 44.3% white) or high adherence (45.4% black vs 47.8% white) ($P=0.04$ for interaction). There were no racial differences in recommending branded agents when stratified by adherence information in the hypertension ($P=0.14$ for interaction) or diabetes ($P=0.83$ for interaction) vignettes (results not shown). Similarly, there were no racial differences in recommending branded agents when stratified by respondents' state of practice for any of the three vignettes ($P>0.30$ for all interactions).

Compared with respondents randomized to view white patients, respondents randomized to view black patients reported lower forecasts of patient adherence in the hypertension ($P<0.001$, mean: 7.3 black vs 7.7 white) and diabetes vignettes ($P=0.049$, mean: 7.4 black vs 7.6 white) (Table 3). Racial differences in forecasts of estimated adherence in the hypertension and diabetes vignettes were comparable when

stratified by physician state of practice ($P>0.46$ for interaction tests). There was no overall difference in adherence forecast by race in the hypercholesterolemia vignette ($P=0.15$, mean: 7.2 black vs 7.3 white). However, findings differed when stratified by state of practice. Respondents in Texas reported lower forecasts for black patients compared with white patients (mean: 7.2 black vs 7.6 white), respondents in Florida reported higher adherence forecasts for black patients (mean: 7.6 black vs 7.2 white), and there were no racial differences in Massachusetts (mean: 7.3 black vs 7.2 white) or North Carolina (mean: 6.9 black vs 7.1 white) ($P=0.05$ for interaction). Forecasts of patient adherence were comparable when stratified by respondents' reported level of adherence information ($P>0.26$ for all comparisons, results not shown).

Respondents reported comparable distributions of confidence levels in their adherence forecasts in the hypercholesterolemia ($P=0.98$, mean: 3.2 black vs 3.2 white), diabetes ($P=0.55$, mean: 3.3 black vs 3.4 white), and hypertension ($P=0.09$, mean: 3.2 black vs 3.3 white) vignettes. Racial differences in respondents' confidence in adherence forecasts, however, differed by state of practice in the hypercholesterolemia vignette. Respondents in Florida randomized to view black patients reported higher confidence levels than those randomized to view white patients (mean: 3.4 black vs 3.2 white), while

Table 1. Survey Respondent Characteristics

	Overall	White patient	Black patient	P
n	716	345	371	–
Demographics				
Female gender	31.4	27.5	35.0	0.089
Self-reported race/ethnicity				0.72
White	53.8	55.1	52.6	
Black	8.1	7.5	8.6	
Asian	17.5	16.2	18.6	
Hispanic	11.3	12.5	10.2	
Other/multiracial/ not reported	9.4	8.7	10.0	
Training				
Board certification	79.6	78.8	80.3	0.65
International medical graduate	30.6	32.5	28.8	0.34
Medical specialty				0.22
Family practice	62.3	64.6	60.1	
Internal medicine	37.7	35.4	39.9	
Practice characteristics				
Mean years of experience (SD)	14.1 (10.0)	14.7 (10.7)	13.5 (9.3)	0.093
80% or more time clinical practice	86.2	87.5	85.2	0.68
Number of physicians in practice				0.97
1	30.6	31.6	29.7	
2	14.9	15.1	14.8	
3 to 4	18.6	18.0	19.1	
5 to 10	19.8	19.1	20.5	
10 or more	16.1	16.2	15.9	
State				0.040
Florida	21.5	24.5	18.9	
Massachusetts	17.6	18.0	17.3	
North Carolina	31.3	26.4	35.9	
Texas	29.6	31.3	28.0	
Racial/ethnic composition of patients				0.63
White	49.4	50.1	48.7	
Black	23.5	21.7	25.2	
Hispanic	22.4	23.9	21.1	
Other	4.7	4.3	5.0	
Patients' insurance type				0.98
Medicaid	21.5	21.9	21.1	
Medicare	33.2	32.6	33.7	
Other	34.4	34.3	34.5	
No insurance	11.0	11.2	10.8	
Predominant patient income type				0.35
Low	39.7	40.3	39.1	
Medium	35.3	32.5	38.0	
High	0.7	0.6	0.8	
Mixed	24.3	26.7	22.1	

Findings expressed as proportions. Due to rounding, columns may not sum to 100

respondents in other states reported racially comparable confidence levels (Massachusetts 3.2 black vs 3.0 white, North Carolina 3.1 black vs 3.2 white, Texas 3.2 black vs 3.3 white) ($P=0.04$ for interaction). A similar pattern was observed in the diabetes vignette, with respondents in Florida reporting greater confidence in their adherence forecast for black patients compared with white patients (mean: 3.5 black vs 3.2 white), but no racial difference in Massachusetts (mean: 3.2 black vs 3.2 white), North Carolina (mean: 3.3 black vs 3.4 white), or Texas (mean: 3.2 black vs 3.4 white) ($P=0.08$ for interaction). Forecast confidence levels were comparable when stratified by

respondents' reported level of adherence information ($P>0.46$ for all comparisons, results not shown).

DISCUSSION

Our web-based study of primary care physicians found that patient race did not influence physicians' decisions of whether to recommend a new medication for patients presenting with hypertension, hypercholesterolemia, and diabetes mellitus. Although patient race did influence physicians' choice of therapeutic class for patients presenting with hypertension and produced different physician estimates of patient adherence, these differences were generally small. The results of this randomized experiment do not support the hypothesis that racial differences in hypertension, hypercholesterolemia, and diabetes medication use in the outpatient setting are attributable to differential physician prescribing patterns based on patient race.

The absence of a racial difference in the overall decision to recommend a medication in each of the vignettes is reassuring given concerns of physicians' differential treatment by race. Nevertheless, two instances of racial differences in the choice of medication observed in this study, specifically choice of therapeutic

Table 2. Physician Treatment Recommendations

	Overall	White patient	Black patient	P
n	716	345	371	–
Hypercholesterolemia vignette				
Recommend any treatment	99.7	100	99.5	0.50
Recommended drug class				0.88
Statin	97.9	98.0	97.4	
Cholesterol absorption inhibitor	0.7	0.9	0.5	
Niacin	0.6	0.3	0.8	
Bile acid sequestrant	0.3	0.3	0.3	
Other/no recommendation	0.6	0.6	0.5	
Brand agent recommended	44.6	42.0	46.9	0.20
Hypertension vignette				
Recommend any treatment	99.6	99.7	99.5	1.00
Recommended drug class				<0.001
Angiotensin-converting enzyme inhibitor	54.8	62.6	47.4	
Angiotensin receptor blocker	11.9	11.0	12.7	
Beta blocker	18.9	20.6	17.3	
Calcium channel blocker, dihydropyridine	8.9	2.3	15.1	
Calcium channel blocker, non-dihydropyridine	3.4	0.9	5.7	
Aldosterone receptor blocker	0.6	0.9	0.3	
Other/no recommendation	1.7	1.7	1.6	
Brand agent recommended	18.2	18.0	18.3	0.92
Diabetes vignette				
Recommend any treatment	99.7	99.7	99.7	1.00
Recommended drug class				0.38
Alpha-glucosidase inhibitor	0.1	0.0	0.3	
Biguanide	69.0	65.8	72.0	
Dipeptidyl peptidase-4 inhibitor	1.1	0.9	1.4	
Glitazone	6.8	6.7	7.0	
Glucagon-like peptide-1 analog	1.0	0.9	1.1	
Meglitinide	0.8	1.2	0.5	
Sulfonylurea	16.5	18.8	14.3	
Other/no recommendation	4.6	5.8	3.5	
Brand agent recommended	9.9	9.9	10.2	0.80

Findings expressed as proportions. Due to rounding, columns may not sum to 100

Table 3. Physician Forecasted Adherence

	Overall	White patient	Black patient	P
Hypercholesterolemia vignette				
n	714	345	369	
Likelihood forecast of patient complying with prescribed treatment				0.15
Mean, standard deviation	7.2 (1.5)	7.3 (1.5)	7.2 (1.5)	
Median, interquartile range	7 (6–7)	7 (7–7)	7 (6–7)	
Confidence in forecast of patient compliance				0.98
Mean, standard deviation	3.2 (0.8)	3.2 (0.8)	3.2 (0.9)	
Median, interquartile range	3 (3–3)	3 (3–3)	3 (3–3)	
Hypertension vignette				
n	713	344	369	
Likelihood forecast of patient complying with prescribed treatment				<0.001
Mean, standard deviation	7.5 (1.5)	7.7 (1.5)	7.3 (1.6)	
Median, interquartile range	8 (7–8)	8 (7–8)	7 (6–7)	
Confidence in forecast of patient compliance				0.09
Mean, standard deviation	3.3 (0.8)	3.3 (0.8)	3.2 (0.8)	
Median, interquartile range	3 (3–3)	3 (3–3)	3 (3–3)	
Diabetes vignette				
n	714	344	370	
Likelihood forecast of patient complying with prescribed treatment				0.05
Mean, standard deviation	7.5 (1.3)	7.6 (1.3)	7.4 (1.4)	
Median, interquartile range	8 (7–8)	8 (7–8)	7 (7–7)	
Confidence in forecast of patient compliance				0.55
Mean, standard deviation	3.3 (0.8)	3.4 (0.7)	3.3 (0.8)	
Median, interquartile range	3 (3–3)	3 (3–3)	3 (3–3)	

Likelihood forecast of patient compliance estimated with 10-point Likert (1, definitely not comply; 10, definitely comply). Confidence in forecast of patient compliance estimated with 5-point Likert (1, not confident; 5, extremely confident)

Number (n) differs from 716 because physicians who did not recommend any additional medications did not provide ratings for patient adherence forecasts or confidence in their forecast of patient adherence

tic class in the hypertension vignette and the interaction between patient race and adherence information for recommendation of an on-patent brand agent in the hypercholesterolemia vignette, appear to suggest that race may influence prescribing decisions.

In both instances, however, we believe other processes account for these findings. First, the lower rates of ACE inhibitor prescription were offset by higher rates of calcium channel blocker prescribing for black patients. This parallels previous reports of racial differences in hypertension treatment.¹⁴ This practice likely reflects data suggesting that, on average, white patients respond better to ACE inhibitors, while black patients respond better to calcium channel blockers.¹⁵ Although the average differential response between racial groups is modest and much smaller than the variation in response within each racial group,¹⁶ racial differences in treatment response are cited in current practice guidelines.¹⁷ Respondents, likely aware of these guidelines, may have tailored their prescribing decisions accordingly. In contrast, we have no ready explanation for the findings in the hypercholesterolemia vignette of a racial difference in the rate of branded agent prescription when no adherence information was provided and no racial difference when adherence information was provided. Given the nature of the interaction suggested, the number of interaction tests conducted, and the lack of comparable finding for the other two vignettes, a chance finding arising from multiple testing is the most plausible explanation.

There are several possible explanations for the absence of racial differences in physicians' treatment recommendations observed in our study. First, because our study was based on an on-line experiment rather than an observational assessment of the clinical environment, our findings may not reflect daily practice accurately. However, other studies of the effect of patient race on physician decision making that use similar experimental designs report differences in physicians' treat-

ment decisions as a function of race.^{10,18,19} Thus, the lack of a racial difference cannot be attributed to the study's experimental nature. Second, by relying on a single photo of a patient actor, the patient actors' race may not have been communicated to respondents or otherwise elicited elements of the patient-physician interaction, including both verbal and non-verbal communication, that produce racially divergent treatment recommendations. However, previous studies relying on print photographs or simple textual descriptions of patient race without accompanying images have elicited racially divergent responses.^{18,19} Further, the racially divergent choice of agents in the hypertension vignette and the modestly lower mean estimated adherence reported in the hypertension and diabetes vignettes demonstrate that the respondents reacted to the race of the patient actor to which they were randomized. Thus, the findings of the study are likely not artifacts of its design or the manner in which patient race was portrayed.

The lack of a racial difference in whether to recommend a new medication may be attributable to the clear need for additional medication in each vignette. For example, patient data presented in the hypercholesterolemia vignette meet requirements for medication use per current ATP-III clinical practice guidelines.²⁰ Respondents likely recognized the need for treatment, as suggested by the virtual unanimity of medication prescription across all three vignettes. As such, the lack of a racial difference in treatment is consonant with the hypothesis that racial differences in treatment manifest primarily in situations of clinical uncertainty, but are unlikely to appear in cases in which treatment decisions are clear.²¹ Although such an explanation likely accounts for the lack of a racial difference in overall rates of treatment, it may not fully explain the lack of a racial difference in choice of therapeutic class in the hypercholesterolemia and diabetes vignettes or the

equal recommendation of on-patent medications in all three vignettes.

While the absence of a racial difference in treatment here suggests that patient race itself may not account for previously reported racial variations in the treatment of hypercholesterolemia, hypertension, and diabetes, our findings should not be interpreted to suggest that patient race has no impact on the patient-physician encounter. The small yet consistent racial differences in forecasted adherence suggest that physicians observe patient race and draw inferences from that information in the clinical encounter, as noted in previous studies.^{22,23} Although black patients may have greater difficulty with medication adherence because of financial, insurance, and other socioeconomic factors,²⁴ the pattern of slightly lower forecasted adherence for the black patient actors persisted across all levels of historical adherence information. Findings from the hypercholesterolemia vignette suggest racial differences in forecasted adherence may vary across states, but the lack of similar findings in the hypertension and diabetes vignettes make such an explanation unlikely. Interpreting medication recommendation and forecasted adherence data together, our findings suggest that, although patient race may influence physicians' perceptions of patients, patient race itself does not influence physicians' medication decisions.

Our study has several limitations. We surveyed primary care physicians in Florida, Massachusetts, North Carolina, and Texas who treat Medicare and Medicaid patients; thus, our findings may not be generalizable to other physician specialties, geographic regions, or patient populations. Moreover, the survey's low response rate, likely a consequence of its length, content, and web-based administration, raise concerns about the generalizability of our findings to the sampling frame. Independent of concerns about generalizability, however, our use of a randomized design limits concerns of internal validity or biases regarding the effect of patient race. Physician treatment patterns captured in our vignettes may differ from treatment patterns in actual practice for several reasons: most patients differ from our hypothetical ones; physicians' decisions for a hypothetical patient may not reflect accurately what they would do in a real-world situation; and use of vignettes eliminates several potential sources of disparities, such as those that arise due to communication barriers. However, vignettes provide a validated means of directly assessing processes of care provided in actual clinical practice and are valid proxies for actual physician behavior.²⁵ Finally, although our findings demonstrate that patient race has no effect on the decision to treat patients in the ambulatory setting for the three conditions we surveyed, race may influence the patient-clinician encounter in a manner not reflected in our study.

In conclusion, our experimental assessment of primary care physicians' prescribing patterns found minimal evidence that patient race influenced physicians' prescribing decisions for patients presenting with hypertension, hypercholesterolemia, and diabetes mellitus. While patient race informed physicians' perceptions of their patients, as demonstrated by modestly lower forecasted adherence for black patients compared with white patients, there was no evidence of adverse racial differences in choice of treatment. Although not definitive, these data suggest that reports of racial

differences in the management of hypertension, hypercholesterolemia, and diabetes in the outpatient setting may be attributable to factors other than prescribing decisions based on patient race itself.

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