Race Differences in Cardiac Catheterization: The Role of Social Contextual Variables

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BACKGROUND: Race differences in the receipt of invasive cardiac procedures are well-documented but the etiology remains poorly understood.

OBJECTIVE: We examined how social contextual variables were related to race differences in the likelihood of receiving cardiac catheterization in a sample of veterans who were recommended to undergo the procedure by a physician.

DESIGN: Prospective observational cohort study.

PARTICIPANTS: A subsample from a study examining race disparities in cardiac catheterization of 48 Black/African American and 189 White veterans who were recommended by a physician to undergo cardiac catheterization.

MEASURES: We assessed social contextual variables (e.g., knowing somebody who had the procedure, being encouraged by family or friends), clinical variables (e.g., hypertension, maximal medical therapy), and if participants received cardiac catheterization at any point during the study.

KEY RESULTS: Blacks/African Americans were less likely to undergo cardiac catheterization compared to Whites even after controlling for age, education, and clinical variables (OR=0.31; 95% CI, 0.13, 0.75). After controlling for demographic and clinical variables, three social contextual variables were significantly related to increased likelihood of receiving catheterization: knowing someone who had undergone the procedure (OR=3.14; 95% CI, 1.70, 8.74), social support (OR=2.05; 95% CI, 1.17, 2.78), and being encouraged by family to have procedure (OR=1.45; 95% CI, 1.08, 1.90). After adding the social contextual variables, race was no longer significantly related to the likelihood of receiving catheterization, thus suggesting that social context plays an important role in the relationship between race and cardiac catheterization.

CONCLUSIONS: Our results suggest that social contextual factors are related to the likelihood of receiving recommended care. In addition, accounting for these relationships attenuated the observed race disparities between Whites and Blacks/African Americans who were recommended to undergo cardiac catheterization by their physicians.

KEY WORDS: race; differences; cardiac; catheterization.

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Race differences in the receipt of invasive cardiac procedures have been well-documented,^{1,2} but their etiology remains poorly understood. Although the magnitude of these differences may vary according to sample characteristics, data sources, and study methodology, the preponderance of research suggests that Blacks/African Americans are less likely to receive invasive diagnostic or revascularization procedures for coronary artery disease compared to Whites. Although all of the sources of these disparities are not known, it is clear that the mechanisms underlying race differences in cardiac care are complex and multidimensional and include individual patient factors (e.g., clinical characteristics, health beliefs), physician factors (e.g., practice patterns, availability of technology, stereotypes), and structural factors (e.g., access to and reimbursement for care).^{1,3} Identifying sources of the disparities in cardiac care remains critical given the persistent differences in cardiovascular disease between Whites and Blacks/African Americans, and their contribution to excess mortality among the latter.⁴

One possible explanation for disparities in cardiac care could be patient treatment preference.⁵ Black/African Americans are significantly less likely to prefer surgical or invasive treatment for a number of conditions, including spinal conditions,⁶ cancer screening,⁷ and invasive cardiovascular procedures.⁸ Studies have found that Blacks/African Americans are more likely to refuse recommended invasive cardiac procedures,⁹ even within the VA where financial issues are not a concern.¹⁰ Few studies, however, have examined factors associated with refusal or non-receipt of recommended cardiac procedures in the context of race. Qualitative studies examining race differences in cardiac patients' treatment decision making suggest three levels of factors associated with decision making among Blacks and Whites: (a) health care system (e.g., number of doctors involved with care); (b) personal/social (e.g., role of family); (c) and physician (e.g., quality of communication).^{3,11} In these studies, Blacks/African Americans reported several additional factors, including discrimination in the health care system, religion and faith in God, and the need for a physician who understands their symptoms and complaints. In addition, mistrust of the health care system in general might contribute to treatment preference and refusal of recommended care.¹²

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The relationship between social factors and treatment preferences is also important to understand.⁵ Ferguson identified a number of social contextual factors associated with treatment preference, including discussions with family members, knowing somebody who had the procedure, and religious beliefs. Similarly, a study by Whittle and colleagues found that knowing somebody who had undergone an invasive cardiac procedure was related to increased willingness to undergo a hypothetical invasive cardiac procedure if it was recommended by a physician.¹³ In addition, religiosity and attendance at religious services are important in treatment decision making¹⁴ and may reflect an important source of social support.^{15,16} Focusing on social contextual factors is particularly useful given the benefits of interventions aimed at social contextual variables and cardiac care. For example, an intervention involving peer support increased participants' self-care behaviors associated with the prevention of heart disease.¹⁷

The purpose of the current study was to expand upon prior findings and examine how social contextual variables were related to the actual receipt of cardiac catheterization among Blacks/African Americans and Whites who were recommended to have cardiac catheterization by their physician, while simultaneously controlling for clinical and sociodemographic factors that are also known to influence procedure use. We hypothesized that social contextual variables would account for at least some of the race differences in the receipt of recommended cardiac catheterization, after adjusting for other known confounders.

METHOD

Study Setting and Sample

The study methodology has been described in detail elsewhere.¹ Briefly, the study was conducted at five large, urban, academically-affiliated Department of Veterans Affairs (VA) Medical Centers with on-site catheterization laboratories (Houston, Pittsburgh, Atlanta, Durham, St. Louis). A prospective cohort of patients likely to have coronary artery disease was established by screening the results of all cardiac nuclear imaging studies performed between August, 1999, and January, 2001. Nuclear imaging study results were considered positive if there was any evidence of reversible cardiac ischemia (evidenced by reversible defects or redistribution). A total of 1,045 (23% African American, 77% White) patients were included in the final overall baseline sample (a 76% response rate); we selected a subsample for the present analysis.

We used a two-step process to identify patients recommended for catheterization. First, we identified patients who responded positively to an item asking if he or she was offered the option of cardiac catheterization by their physician. Second, we checked these patient reports against physicians' reports of referral for cardiac catheterization. Only patients whose self-report and physician report both indicated that the patient was offered the option of catheterization were included in the current analyses. In total, 417 patients reported that they were not given the option of catheterization, 187 were missing data on this item, and 160 patients reported being given the option of catheterization while their physician indicated that they were

not referred for cardiac catheterization. An additional 44 patients were excluded due to missing data on one or more of the other study variables. The final sample consisted of 237 patients.

Procedure

Data were collected from two serially administered questionnaires which included non-overlapping content: one completed within four weeks after the patient's nuclear imaging study and one completed after the patient reported having received the nuclear imaging study results. Patients were contacted by the study research assistant in person or by phone.

Measures

Sociodemographic Information. Patients were asked about their age, education and self-reported race (0=White, 1=Black).

Clinical and Treatment Variables. Clinical and treatment variables were collected by trained nurses who abstracted each patient's medical records. Clinical variables included cardiac symptoms, and medical history (including prior myocardial infarction, hypertension, diabetes, congestive heart failure, renal dysfunction, and lung disease). Maximal medical therapy was identified by using the definition used by the American College of Cardiology/American Heart Association guidelines for coronary angiography and the management of patients with chronic stable angina.^{18,19} Data regarding receipt of catheterization was also collected from patients' medical records. These variables were coded as 0=No and 1=Yes. As part of the study questionnaire, patients were also queried about their anginal symptoms, resulting in two scores: anginal stability (0–100 with higher scores indicating greater stability) and anginal frequency (0–100 with higher scores indicating less frequency). Participants who reported no angina received scores of 100 on both variables.

Social Contextual Variables. We included several social contextual variables in our model. Social support was assessed using three items: (a) satisfaction with family relationships, (b) satisfaction with frequency of social contact with friends and relatives, and (c) satisfaction with frequency of contact with someone the patient trusts and can confide in.²⁰ Respondents answered yes or no with scores reflecting the number of items to which the respondent answered "yes." This scale had acceptable internal reliability for a brief scale among Whites (Cronbach $\alpha=0.60$) and Black/African Americans ($\alpha=0.62$). We also assessed whether patients knew any family or friends who had a heart catheterization (0=No, 1=Yes), how well they knew the person who gave him or her the nuclear imaging results (1=Not at all to 5=Very well), if it would be hard on their family if they were in the hospital for more than a couple of days (1=Not at all to 5=Extremely so), and if their family encouraged them to have a heart catheterization (1=Not at all to 5=Extremely so). Marital status was assessed by self-report and was coded as 0=Not Married, 1=Married. Finally,

we assessed religiosity using one item asking about how often patients attend religious services (1=Never/almost never, 8=Daily/more often).

Analyses

Logistic regression models were fit to test the association of social contextual variables with the receipt of heart catheterization after accounting for other factors that might also influence the outcome, as well as clustering of patients within site of care. The first step of the model included the demographic variables of age, education, and race. The second step added clinical (prior myocardial infarction, hypertension, diabetes, congestive heart failure, renal dysfunction, anginal frequency, anginal severity, and lung disease) and treatment variables (maximal medical therapy). The third and final step included the social contextual variables of marital status, social support, familiarity with person who gave results, knowing somebody who had catheterization, perceived difficulty for family if patient was hospitalized, being encouraged by family to have catheterization, and religiosity. The predictive power of the models was examined by use of the area under the ROC curve (C statistic). Values near 0.50 reflect a model with no apparent accuracy, while a value of 1.0 reflects perfect accuracy. Clustering of patients within site of care was not significantly related to the outcome variable so it is not reported for efficiency of presentation.

RESULTS

Sample characteristics are presented in Table 1. In terms of race differences in clinical/treatment variables, fewer Blacks/African Americans reported prior revascularization (22.9%)

compared to Whites (37.9%), but significantly more Blacks/African Americans reported hypertension (91.7% versus 77.0%). There were also race differences in social contextual variables, with significantly fewer Blacks/African Americans reporting being married (47.9% versus 62.2%) or knowing a family member or friend who had catheterization (62.5% versus 78.8%). However, Blacks/African Americans reported higher religiosity scores ($M=6.18$, $SD=1.46$) than Whites ($M=4.63$, $SD=2.13$). Finally, among this subsample of patients referred for catheterization, fewer Blacks/African Americans ultimately received catheterization (77.1%) compared to Whites (89.7%).

The logistic regression model revealed a number of associations with the likelihood of receiving catheterization among this subsample of patients (see Table 2). The baseline model ($C=0.60$) including the demographic variables of age, education, and race indicated that Blacks/African Americans were significantly less likely than Whites to have catheterization ($OR=0.34$; 95% CI, 0.15, 0.79). Age and education were not associated with the likelihood of receiving catheterization.

Adding the clinical and treatment variables in the second model ($C=0.67$) resulted in a slightly lower but still significant OR for Blacks/African Americans ($OR=0.31$; 95% CI, 0.13, 0.75) compared to the first step of the model. However, none of the clinical or treatment variables were related to the likelihood of receiving catheterization.

In the third model ($C=0.79$), three of the social contextual variables were related to the likelihood of receiving catheterization. First, knowing somebody who had catheterization was related to an increased likelihood of receiving catheterization ($OR=3.14$; 95% CI, 1.13, 8.74). Second, higher levels of social support were related to increased likelihood of catheterization ($OR=2.05$; 95% CI, 1.17, 3.60). Third, higher scores on the item assessing if family members encouraged the patient to have catheterization were related to increased likelihood of receiving

Table 1. Sample Characteristics (N=237)

	Black/African Americans N=48	Whites N=189	p-value
Sociodemographic variables			
Age (mean and SD)	61.58 (10.67)	62.59 (9.55)	0.40
Education (mean and SD)	11.97 (2.68)	12.04 (2.61)	0.81
Clinical variables			
Prior revascularization (% yes)	18.6	37.0	0.01
Prior MI (% yes)	23.5	34.7	0.06
Hypertension (%yes)	89.5	78.4	0.02
Angina (% yes)	70.6	72.8	0.69
Congestive heart failure (% yes)	17.4	16.3	0.87
Diabetes (% yes)	30.2	32.1	0.79
Lung disease (% yes)	20.0	24.9	0.39
Renal dysfunction (% yes)	15.1	10.2	0.25
Maximal medical therapy (% yes)	38.4	43.3	0.46
SAQ Anginal frequency (mean and SD)	60.72 (24.69)	60.60 (23.48)	0.99
SAQ Anginal stability (mean and SD)	48.33 (27.95)	51.08 (26.72)	0.48
Social contextual variables			
Married (% yes)	50.0	63.3	0.03
Family/friend had catheterization (% yes)	61.6	80.5	0.01
Social support (mean and SD)	2.22 (0.87)	2.42 (0.85)	0.06
Procedure hard on family (mean and SD)	1.83 (1.27)	1.78 (1.23)	0.78
Familiar with person who gave results (mean and SD)	2.50 (1.51)	2.30 (1.41)	0.25
Family encouraged procedure (mean and SD)	1.93 (1.32)	2.32 (1.51)	0.03
Attend religious services (mean and SD)	6.08 (2.19)	4.16 (2.66)	0.01
Outcome variable			
Receipt of catheterization (% yes)	66.3	81.5	0.03

Table 2. Factors Associated with the Receipt of Cardiac Catheterization Among Patients Referred for the Procedure (N=237)

Variable	Model		
	1	2	3
Sociodemographic			
Age	1.0 (0.96, 1.03)	1.00 (0.97, 1.04)	1.00 (0.96, 1.04)
Education	0.95 (0.83, 1.07)	0.94 (0.82, 1.08)	0.93 (0.81, 1.06)
Race	0.34 (0.17, 0.67)*	0.29 (0.14, 0.60)*	0.44 (0.19, 1.17)
Clinical			
Prior revascularization		1.13 (0.52, 2.48)	0.94 (0.38, 2.93)
Prior myocardial infarction		1.02 (0.48, 2.18)	0.91 (0.39, 2.12)
Hypertension		1.57 (0.68, 3.62)	1.87 (0.72, 4.83)
Angina		0.78 (0.30, 1.99)	0.55 (0.19, 1.58)
Chronic heart failure		0.96 (0.36, 2.54)	0.93 (0.33, 2.64)
Diabetes		0.57 (0.29, 1.14)	0.55 (0.26, 1.18)
Lung disease		0.52 (0.25, 1.15)	0.44 (0.19, 1.03)
Renal dysfunction		0.44 (0.16, 1.23)	0.39 (0.14, 1.17)
Maximal medical therapy		0.80 (0.40, 1.62)	1.13 (0.51, 2.48)
Anginal frequency		0.99 (0.97, 1.02)	1.00 (0.98, 1.02)
Anginal stability		1.00 (0.99, 1.02)	1.00 (0.99, 1.01)
Social contextual variables			
Married			0.84 (0.38, 1.85)
Family/friend had catheterization			3.83 (1.70, 8.65)*
Social support			2.77 (1.13, 2.80)*
Procedure hard on family			0.98 (0.74, 1.30)
Familiar with person who gave results			0.88 (0.67, 1.12)
Family encouraged procedure			1.43 (1.08, 1.90)*
Religiosity			0.92 (0.80, 1.06)
Area under the ROC curve	0.60	0.67	0.79

Note. * $p < 0.05$.

catheterization (OR=1.45; 95% CI, 1.02, 2.06). Interestingly, the addition of social contextual variables into the model resulted in the race variable becoming non-significant (OR=0.46; 95% CI, 0.17, 1.29).

DISCUSSION

The purpose of this study was to examine the role of race and social contextual variables on cardiac catheterization use among patients who were recommended to receive the procedure. Results from the models that adjusted for demographic and clinical/treatment variables indicated that Blacks/African Americans were less likely to receive catheterization than Whites. However, this relationship became non-significant when social contextual variables were added to the model, suggesting that social contextual variables might play an important part in the relationship between race and the receipt of recommended cardiac catheterization, among those referred for the procedure.

Our findings are consistent with the notion that social contextual variables can influence the acceptability of medical treatments.²¹ Three of the social contextual variables were significantly related to the likelihood of receiving catheterization. First, knowing somebody who had cardiac catheterization was related to increased likelihood of receiving the recommended treatment. This is consistent with previous qualitative findings that knowing somebody who had a procedure influenced cardiac patients' treatment decision making.³ Second, having family members who encouraged the patient to undergo cardiac catheterization was related to an increase in the likelihood of actually undergoing the procedure. Again, this finding supports previous findings indicating that family members play an important role in cardiac treatment deci-

sions.^{3,22} Finally, overall social support was related to increased likelihood of receiving catheterization. This finding is similar to previous research that suggests that social support is related to less aversion to invasive procedures among Blacks/African Americans and Whites.²¹

Interestingly, none of the clinical variables included in our model were related to the receipt of cardiac catheterization. This finding may, however, be due to the homogeneous nature of the sub-sample we examined. All of the patients in our sample were recommended to have cardiac catheterization by their physician. Thus, it is likely that the clinical characteristics of the patients were already considered by the physician prior to recommending catheterization, thus resulting in less variability in clinical variables compared to the parent sample.

The reported results should be interpreted in the context of the study limitations. First, our sample consisted of male veterans using VA care, and the results may not generalize to the general population. Second, although the items were from established measures or were constructed based on findings from focus groups,²³ a number of the social contextual variables were single items, which may limit their reliability and validity. Third, the reasons for the patient not receiving the recommended procedure are unknown. Fourth, the study was conducted within the equal-access VA health care system, thus perhaps limiting the generalizability of the findings to the broader health care system where cost is a greater consideration. Fifth, our sample did not include other minority groups (e.g., Hispanic/Latinos) due to the focus of previous literature on differences between Whites and Black/African Americans and the lack of resources to recruit a sufficient number of Hispanic/Latino patients, thus limiting the study generalizability. Finally, we did not include physician characteristics in our model because we chose to focus primarily on individual-level factors that are related to the receipt of recommended care, and

we also had only limited data on physician characteristics. Factors such as communication skills, years of practice, and patient volume (which we did not assess) might influence patients' decisions to undergo certain procedures.

Despite these limitations, the results of this study have implications for the care of patients who are recommended to receive cardiac catheterization. First, our results indicate that physicians should consider the social context in which patients make treatment decisions, and when facing resistance from patients to adhering to recommendations, to explore the possible negative influences of the patient's social system. For example, physicians could ask patients if family and friends are encouraging a particular decision or behavior or if they know anybody who had a similar procedure. Second, the findings suggest that race differences in the likelihood of undergoing a recommended procedure may be, at least in part, due to social contextual variables, suggesting that clinical treatment decision making processes might capitalize on social contextual variables to encourage patients to have needed procedures. For example, encouraging and assisting family members to talk to patients about the benefits of cardiac catheterizations could increase the chances that the patient follows physician recommendations for such procedures. For example, group interventions involving the patient and his or her family could focus on the benefits of a particular procedure and effective communication techniques for discussing medical decisions (e.g., discuss concerns, treatment values). Likewise, the finding that knowing somebody who has undergone cardiac catheterization increased the likelihood of having the procedure suggests that perhaps pairing patients with similar others who have had the procedure (e.g. peer health educators) could maximize the likelihood of the patient feeling more comfortable with the procedure and thus deciding to have the procedure him or herself. This might be particularly important among Black/African Americans because, according to our data, they are less likely to have family or friends who have undergone the procedure.

CONCLUSION

Despite numerous efforts to understand race differences in cardiac care, they remain persistent and widespread. Identifying correlates of receiving recommended care could reduce these disparities and maximize the likelihood that patients undergo recommended cardiac procedures. Our results suggest that social contextual factors are related to the likelihood of receiving recommended care and that interventions aimed at this dimension may help to reduce race differences in the receipt of recommended care. Future research is needed to verify these findings and to identify specific modifiable targets for interventions aimed at increasing the likelihood of patients receiving recommended cardiac care.

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Conflict of Interest: None disclosed.

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