PHYSICIAN BIAS: DOES IT OCCUR AT TEACHING HOSPITALS THAT SERVE A MAJORITY OF AFRICAN AMERICAN PATIENTS?

James Gerard Caillier, PhD; Sandra C. Brown, DNS, FNP-C; Sharon Parsons, PhD; Phillip J. Ardoin, PhD; Peter Cruise, PhD

Objectives: The purpose of this study was to examine physician bias when patients present with cardiovascular disease in a teaching hospital that treats a majority of African American patients. Physician bias was deemed to occur when cardiovascular disease patients did not receive an invasive procedure when needed.

Methods: The hospital in the study was a teaching facility in southeastern Louisiana. We conducted a longitudinal retrospective review of 177 medical records from patients with cardiovascular disease. Patient charts were examined using specific indicators (type of pain, lab work, blood pressure, and x-ray tests) from the Framingham study (1996) to determine whether patients met the criteria for eligibility of invasive procedures, such as percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass graft (CABG) and if so, whether they were referred accordingly. Next, these charts were used to obtain confounders (race, sex, income, age, disease severity, and diagnoses) from each patient. Finally, a logistic regression analysis was used to determine the effect of these confounders on a patient being referred by a physician.

Results: The model failed to find a statistically significant disparity between physician referrals for African Americans and Caucasians when cardiovascular disease patients met specific criteria. Therefore, physician referral disparities did not exist among this study population. This occurred despite the fact that the study controlled for primary diagnoses, disease severity, age, income, sex, and race.

Conclusion: This research concludes that physicians' referral patterns for cardiac procedures were similar for both African Americans and Caucasians. Moreover, this research suggests that referral disparities may not exist at teaching hospitals that serve a majority of African American patients. Future studies should delve deeper into physician/patient interaction at these institutions to understand what they do to reduce disparities in the hope of implementing their methods at other hospitals. (*Ethn Dis*. 2007;17:461–466)

Key Words: Physician Bias, Disparities, Teaching Hospitals, and Cardiovascular Disease

From Bowie State University, Bowie, Maryland (JGC); Southern University A&M (SCB, SP); Appalachian State University (PJA) and the University of California at Chico (PC).

Address correspondence and reprint requests to James Gerard Caillier, PhD; Bowie State University; MLK Room 323; 14000 Jericho Park Rd.; Bowie, MD 20715. 301-860-3637; 301-860-3644 (fax); jcaillier@bowiestate.edu

INTRODUCTION

One of the main goals of the US Department of Health and Human Services "is to eliminate health disparities among different segments of the population"[1] because research has consistently shown that minorities receive disparate medical care when compared to Caucasians. Researchers have long established that socioeconomic status[2–3] and lifestyle[4] are contributing factors. However, more researchers are finding that physician bias causes unequal racial medical care despite controlling for socioeconomic status and lifestyle[5]—meaning physicians refer African Americans less often for preferred treatment than Caucasians. For example, researchers have found that a physician's treatment decisions are influenced, either consciously or unconsciously, by a patient's race.[6–10]

This research attempts to further these studies by examining the physician, the gatekeeper, of those services. In doing so, the study examined physician referral patterns in a teaching hospital that treats a majority of African American patients. Following, this research hypothesizes that physician referral patterns for invasive cardiac procedures will be the same for African Americans and Caucasians.

PHYSICIAN BIAS IN TREATMENT

Race and sex differences in cardiovascular disease treatment led Schulman and others[5] to examine the treatment process. In their study, 720 physicians viewed taped interviews and analyzed medical data of eight patients. The patients were actors, four Caucasian patients and four African American patients, and they were equally split between sex and ages of 55 and 70. All complained of the same symptoms. The researchers concluded that a patient's race and sex were significantly associated with the physicians' decisions about whether to make referrals for cardiac catheterization, with males and Caucasians more likely to be referred than females and African Americans, respectively. Females were 60% as likely to be referred for cardiac catheterization as males and Caucasians. African American females were referred only 40% as often as Caucasian males.

The study examined physician referral patterns in a teaching hospital that treats a majority of African American patients

Another study conducted by Ibrahim and others[11] examined physician recommendations for cardiac procedures according to race at a Veterans Affairs hospital and a university hospital in the Northeast. Cardiologists were interviewed regarding their treatment decisions. The researchers found that African American patients were less likely when compared to Caucasians to be recommended for cardiac care at only the VA hospital (27% vs 50%, respectively). However, the study failed to find a statistically significant difference at the university hospital. More-

over, only 7% of the study participants were African Americans.

There were two major limitations to this research. First, the study did not control for comorbidity or disease severity and lifestyle characteristics. Therefore, African Americans could have been referred less because they might have been too sick to survive the procedure (renal failure, stroke, congestive heart failure, etc). Next, the researchers did not account for the appropriateness of care. For instance, Caucasians may have been referred more often because their symptoms warranted a cardiac procedure.

In our study to further this research, indicators will be used to determine those patients who should have been referred by a physician. These indicators include tests conducted as patients present to medical care with chest pain and are considered necessary for a referral.[12] For example, when a patient presents for medical care with chest pain, the physician performs the following:

1. Obtains blood and urine samples from the patient. These specimens are analyzed in the lab, giving the medical personnel information on the patient's cardiac enzymes, blood cholesterol levels, and treponin.
2. Takes blood pressure (BP). Patient is considered at–risk for coronary artery disease (CAD) when BP >145/86 mm Hg.
3. Conducts electrocardiogram. Patient is referred to either a stress test or an echocardiogram to determine abnormalities including non-specific T waves change, ischemia, and an ejection fraction of 74% or below.
4. If abnormalities are present, refers patient for a cardiac catheterization.
5. From cardiac catheterization, determines if the patient is experiencing coronary spasms, meaning the patient does not have heart disease, or if the patient has CAD. A patient will have CAD when there is significant (70%) narrowing of the arteries.[13]

This study examines patients who met these criteria and should have been referred to an invasive procedure. Patients not meeting these criteria are removed.

METHODS

Site

A retrospective longitudinal review of medical record charts was conducted at an urban public teaching hospital in southeastern Louisiana. This teaching facility is a 157-licensed bed hospital that averages ~150,000 inpatient and outpatient visits a year. Patients who present at the hospital are primarily indigent and are from eight urban and rural parishes. Furthermore, African Americans comprised 67.6% of all patient visits, while Caucasians and Hispanics comprised 26.3% and 3%, respectively.

This urban public hospital does not perform invasive cardiac procedures, which includes coronary artery bypass graft (CABG), cardiac catheterization (CC), percutaneous transluminal coronary angioplasty (PTCA). However, this hospital refers patients for cardiac surgery to another urban public health hospital approximately 80 miles away. Furthermore, carriers funded by the state of Louisiana do provide transportation for patients. Because transportation is provided to patients, equal transportation access is achieved.

Patient Population

When examining physician referrals, the cohort consisted of those patients presenting for care at the hospital that did or did not receive an invasive procedure. Additionally, patients selected for this cohort had to meet the patient selection criteria, described in Figure 1. This selection criteria details when a patient should be referred; patients who did not meet these criteria were not included because their illness did not necessitate an invasive treatment.

Patient Selection Process

A list of possible patients was obtained from the hospitals financial database. This data contained financial and demographic information on each patient, as well as diagnoses. Patients with a primary diagnosis of cardiovascular disease (myocardial infarction, unstable angina, chronic ischemia, angina, chest pain, and all other circulatory diseases) were selected.

Next, to determine if this treatment was the accepted standard of care and therefore should have been prescribed, data were collected from each chart reviewed. The patient's chart was assessed using high-risk indicators from the Framingham study.[12] This process is detailed in Figure 1. Physicians use these indicators as criteria in order to determine a patient's eligibility for CC, and subsequently, CABG, and PTCA.[13] Additionally, only those patients presenting with chest pain were selected. If they had comorbid diagnoses of stroke, cancer, renal failure, psychiatric illnesses, abuse of drugs and alcohol, HIV, cirrohosis, dementia, lung disease, or CHF, the patient was not eligible for the study. These conditions were excluded from the analysis because they are believed to make aggressive management of coronary artery disease less likely.[14] Any one of these diagnoses can cause a physician to determine that quality of life is too poor for them to survive these procedures.

Data Analyses and Confounders

A logistic regression technique was used to determine the influence of confounders on physician referrals. This statistical technique is used to examine the effect of confounders when the model includes a dummy dependent variable, which is coded as 0 and 1. Both logistic regression and probit

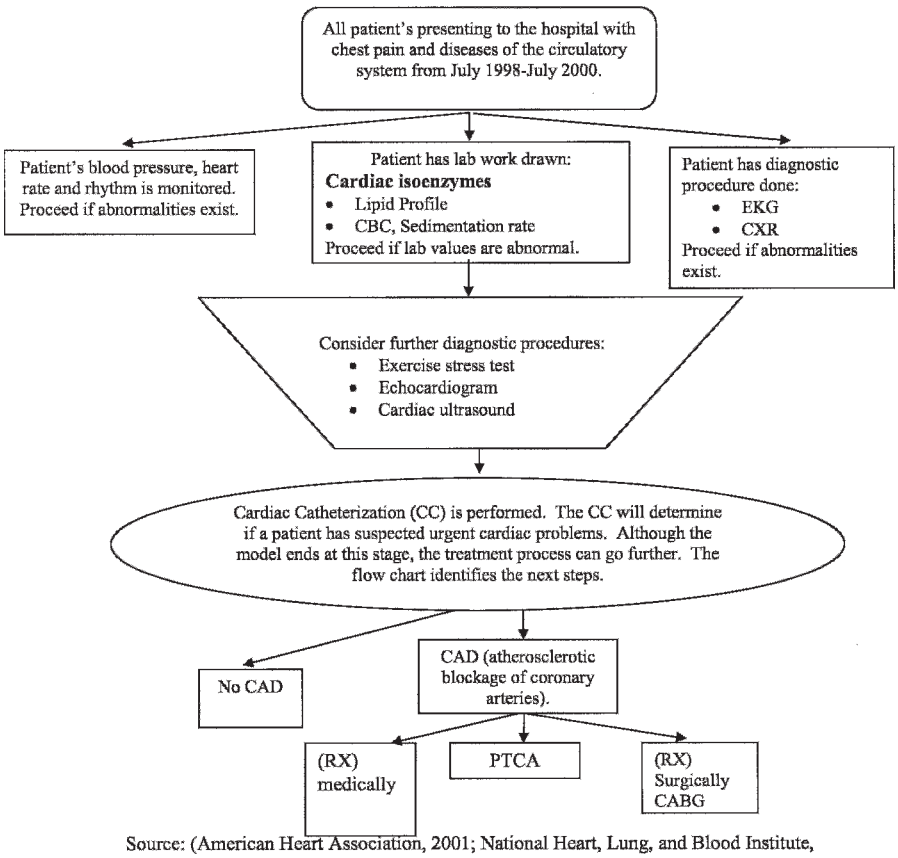

Figure 1. Flow chart describing medical record selection criteria.

models are used to examine the relationship between categorical dependent variables and a set of explanatory variables. However, in a probit model, the function is the inverse of the standard normal curve, whereas the function is the natural log of odds in the logistic regression.[15] Therefore, the logistic model is more simple to interpret because it can be written as a linear model for the log of odds.[16] Also, the probit model does not produce odds ratios, which is beneficial in describing the relationship between a factor and an event.[15]

In the model, the dummy dependent variable was: did the physician refer the patient for a CC, PTCA, or a CABG (yes/no) when the criteria were met? The confounders were: income, marital status, comorbidity, race, sex, age, and principal diagnosis. Non-invasive treatment included procedures such as holter monitors, pacemakers, and cardiac medications.

Principal diagnoses were grouped into six different conditions: 1) myocardial infarction, 2) unstable angina, 3) chronic ischemia, 4) angina, 5) chest pain, and 6) all other circulatory diseases. Comorbidity is used as a proxy for disease severity. These comorbid diagnoses were tallied numerically. For example, one represented one extra diagnosis; two represented two diagnoses, etc so that the more comorbid diagnoses, the greater the expected severity of cardiovascular disease.

To decipher if healthcare providers discriminate based upon sex, male and female patients were coded using dichotomous variables. Race was divided into five different categories (African American, Caucasian, Hispanic, Asian, and other). However, once the selection criteria were applied, only African Americans and Caucasians were eligible for the study. Race was coded by using dichotomous variables.

Age was divided into seven ranges and is classified as 0 through 30, 31 through 40, 41 through 50, 51 through 60, 61 through 70, 71 through 80, and 81 years or older. A patient's income at the time of service was listed in the medical record chart. Therefore, this variable was measured as a continuous variable. An additional analysis was conducted using diabetes as a confounder. Diabetes was coded using dummy variables.

Protection of Human Subjects

An institutional review board (IRB) from Southern University A&M approved the research as well as the hospital's research committee. Medical records were reviewed in the medical record department and were therefore, not removed from the area. Furthermore, patient identifiers (medical record numbers and social security numbers) were secured.

RESULTS

To examine referral patterns, the review included a detailed search of 603 medical record charts. Of these, 177 met the criteria for the cohort (N=177).

Detailed in Table 1, 65% of these patients were 41–60 years of age. African Americans comprised 66% of the medical records selected. Females represented 47.5% of the cohort. Moreover, 68.9% of the patients in the cohort were unmarried. Acute MI, angina, and chest pain encompassed 79.3% of the subjects. Lastly, 44.1% of the patients were referred and 55.9%

Table 1. Demographic characteristics of patients in the cohort

Confounders	Number	Percent
Age		
1–30	1	.6%
31–40	18	10.2%
41–50	63	35%
51–60	54	30.5%
61–70	28	15.8%
71–80	12	6.8%
81 and older	2	1.1%
Race		
African-American	118	66.7%
Caucasian	59	33.3%
Sex		
Male	93	52.5%
Female	84	47.5%
Marital status		
Married	55	31.1%
Unmarried	122	68.9%
Diagnoses		
Acute MI	43	24.3%
Unstable angina	11	6.2%
Ischemia	12	6.8%
Angina	39	22%
Chest pain	59	33.3%
Other diagnoses	13	7.3%
Referred		
Yes	78	44.1%
No	99	55.9%

were not. Lastly, physicians failed to refer 99 patients, while 78 eligible patients in the study were referred.

In Table 2 income, comorbidity and referral data is detailed. When considering sex, females had an average household income of $7,360 and males earned $6,400 annually, both well below the poverty level. Moreover, average secondary diagnoses (comorbidity) for males and females were 4.2 and 4.0, respectively. Finally, Caucasian males (67%) had the highest referral rates, then African American females (60%), followed by African American males (40%) and Caucasian females (33%).

As mentioned, a logistic regression technique was used to examine the effect of confounders (age, sex, ethnicity, comorbidity, marital status, income, and principal diagnoses) on physician cardiac referrals when patients presented with cardiovascular disease. Our aim was to predict physician referral patterns, while controlling for these factors. The results of the logistic regression technique are detailed in Table 3. In Table 3, the model failed to find a statistically significant referral difference between African Americans and Caucasians (OR=.78; $P>.05$). Therefore, African Americans were slightly less likely to be referred for invasive cardiac treatment when compared to Caucasians. When sex was examined, we found a .59 difference in the odds ratio (OR) when the model shifted from male to female, meaning that females were slightly less likely to be referred for cardiac invasive treatment when compared to males. Again, the model failed to find a statistically significant disparity ($P>.05$).

Table 2. Referral patterns of patients by income, comorbidity, and race

Confounders	Income	Comorbidity	Referral (rate per 100)
African-American			
Male	5,978.01	4.7	40
Female	6,833.79	4.1	60
Caucasian			
Male	6,823.79	3.6	67
Female	7,887.42	3.9	33

Other confounders were not statistically significant ($P>.05$). The model failed to find comorbidity differences in referral. Income had no bearing on physician referrals. No statistically significant differences were found for patients 50 years of age and >81 years old. Lastly, the model could not validate referral disparities when patients had primary diagnoses of ischemia and other diagnoses

However, the model posited several statistically significant variables ($P<.05$). Patients ages 61 to 70 years and 71 to 80 years (OR=.22, $P=.00$; OR=0.17, $P=.02$) received fewer referrals than did patients who were 51 to 60 years of age. Patients with primary diagnoses of unstable angina, angina, and chest pain were less likely to be referred than a patients with a primary diagnoses of acute MI ($P<.05$; OR=.14, .13, and .25, respectively).

An additional analysis was conducted using diabetes as a confounder while controlling for age, comorbidity, race, sex, principal diagnosis, and income. In the cohort, 33% of patients were diabetic ($N=94$). Although, the model that included diabetes as a confounder posited a higher R^2 than the previous model that did not include diabetes (.21 vs .17), the model once again failed to find that physicians refer African Americans less often for invasive cardiac treatment ($P>.05$). Moreover,

Table 3. Logistic regression of physician referral

VARIABLES	B	Std. Error	Number of Referrals	Odds Ratio
Constant	2.34***	.71		
Comorbid	−.01	.08		.98
Income		−.00	.00	1.00
Ages				
1–41	−.75	36.66	0	.00
41–50	−.74	.42	26	.47
61–70	−1.45***	.54	10	.22
71–80	−1.74*	.78	3	.17
>81	−8.24	24.04	0	.00
Sex				
Male/female	−.52	.36	39/39	.59
Race				
African American	−.23	.36	51/27	.78
Diagnoses				
Unstable angina	−1.91**	.78	4	.14
Chest pain	−1.96***	.49	17	.13
Angina	−1.35***	.50	16	.25
Ischemia	−.07	.74	8	.93
Other CVD diagnoses	−.99	.70	6	.36

* denotes significant at .05; ** denotes significant at .01; and *** denotes significant at .00
Pseudo R^2 .176
Abbreviations: Coefficient (B); Standard Error (Std. Error)

the R^2 signifies the amount of variation in physician referral patterns that can be explained by the model. Therefore, the model with diabetes explains 21% of the variation in physician referral patterns and the previous model that did not include this confounder can explain 17%.

CONCLUSION

This research concludes that physicians did not refer Caucasians more often than African Americans for invasive cardiac procedures when cardiovascular disease patients presented for care. Therefore, the hypothesis is accepted that states physicians' referral patterns for cardiovascular procedures will be similar for African Americans and Caucasians. Moreover, this study contradicts several studies that documented disparate referral patterns for African Americans.[5,11]

Several possible reasons exist to explain why this study did not validate previous ones. First, in the Schulman et al.[5] study, these substantial differences could have been the result of a videotaped interview shown to physicians at a national conference. The physicians did not interact with patients therefore, the video was impersonal. Also, the physicians did not have the benefit of ordering tests (x-ray, lab tests, etc) and seeing the results. The impersonal element could have caused physicians to become detached from the patient and thus order procedures for African Americans less often. In this study, referrals reflected actual real life decisions that were made by physicians and not impersonal nonbonding interactions. Therefore, it could be possible that disparities lessen when there is a physician patient interaction.

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Next, the study conducted by Ibrahim and others[11] encompassed a small percentage of African Americans (7%), which could cause a large shift in the overall percentage and make the effect look more dramatic than it actually was if only one case was not referred. Their study also did not control for comorbidity or the appropriateness of care—meaning that Caucasians could have been referred more often because they did not have other life-threatening illnesses that would have reduced their candidacy for an invasive procedure or Caucasians may have had the symptoms that would have necessitated an invasive procedure. The inverse could have also been true. At least one study found that African Americans are sicker when they present for care.[4]

Next, there are two other possible reasons why this study contradicted others. First, the site of the study was a teaching hospital. Ibrahim and others[11] examined records at a Veteran Affairs hospital and a university hospital. While they found disparities at the Veterans Affair hospital, they did not find any at the teaching hospital. Therefore, disparities may lessen at teaching hospitals. At least one study suggests that teaching hospitals provide better care and tend to run more tests when patients present for cardiovascular disease.[17]

Lastly, referral differences between African Americans and Caucasians may not occur at facilities where African American patients are in the majority. No empirical studies examined referral patterns at hospitals that treated mainly African Americans. But, several studies have suggested that inequalities in health care are possibly attributable to racial, cultural, and communication barriers between minority patients and healthcare providers.[17–21] Therefore, physicians who are accustomed to

treating African Americans may be able to communicate better to these minorities, thereby, reducing disparities.

However, this study did encompass several weaknesses that could have affected the findings. Although 603 medical record charts were reviewed, only 177 were eligible. Small study numbers can affect percentages when one patient is either referred or not referred. Last, the physician's race could not be examined. Researchers have found that patients prefer physicians of their own race and rate their experience as more participatory when the physician is the same race. For example, studies have suggested that patients of the same race as their physician may be more likely to adhere to their treatment decisions because the patients prefer their physicians' decision-making styles. Furthermore, physicians of the same race as their patients also may be more effective in treating their patients.[21,22]

In summary, our research concludes that physicians' referral patterns for cardiac procedures were similar for both African Americans and Caucasians. Moreover, this study rejects several empirical studies, which found cardiac referral patterns along racial lines. However, this study suggests that disparities may lessen when physicians treat a majority of African Americans and when teaching hospitals are examined. Therefore, future studies should focus on the patient/physician interaction at those hospitals that serve a majority of African American patients and on teaching hospitals. It could be possible that researchers could abstract vital information from these hospitals that could be implemented in other healthcare settings to reduce disparities between African Americans and Caucasians.

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AUTHOR CONTRIBUTIONS

Design concept of study: Caillier, Brown, Parsons
Acquisition of data: Caillier, Parsons
Data analysis and interpretation: Caillier, Brown, Parsons, Cruise
Manuscript draft: Caillier, Cruise
Statistical expertise: Caillier, Ardoin
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Supervision: Caillier, Brown, Parsons, Cruise