Black-White Treatment Differences in Acute Myocardial Infarction

Janet B. Mitchell, Ph.D., and Rezaul K. Khandker, Ph.D.

Previous research has documented that black patients with acute myocardial infarction (AMI) are significantly less likely than white patients to receive cardiac procedures. This article seeks to expand this research by: controlling for the limited ability of low-income elderly to pay for care; and adjusting for the impact of differential mortality. We selected a sample of 18,202 Medicare beneficiaries admitted during 1992 with AMI, and followed them for 90 days. Even after adjusting for other factors, black patients with AMI were less likely to undergo cardiac catheterization, and if catheterized, less likely to receive a revascularization procedure.

INTRODUCTION

The gap between black and white patients in the use of "high-tech" cardiac procedures has been well documented in studies employing a wide range of data sources, including Medicare claims (Ayanian et al., 1993; Boutwell and Mitchell, 1993; Escarce et al., 1993; Goldberg et al., 1992; Udvarhelyi et al., 1992), State hospital discharge abstracts (Carlisle, Leake, and Shapiro, 1995; Wenneker and Epstein, 1989), and Depatment of Veterans Affairs records (Peterson et al., 1994; Whittle et al., 1993). Black patients are consistently less likely to receive cardiac catheterization, coronary artery bypass graft (CABG) surgery, and percutaneous transluminal coronary angioplasty (PTCA), compared with white patients.

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These findings are particularly surprising among Medicare beneficiaries, given their comparable insurance coverage. However, Medicare beneficiaries are still liable for deductibles and copayments, amounts that may total over $1,000 for cardiac surgery. They are also liable for as much as 15 percent above the Medicare Fee Schedule (MFS) amount if they are treated by non-participating surgeons. Such bills may be particularly onerous for black Medicare beneficiaries, who are less likely to have supplemental coverage (either private medigap or Medicaid) (McBean, Warren, and Babish, 1994). While some studies have adjusted for Medicaid eligibility (Ayanian et al., 1993; Escarce et al., 1993), none have been able to adjust for private supplemental coverage or income. Furthermore, while State Medicaid programs cover deductibles and coinsurance for dual Medicare-Medicaid eligibles, they will not pay any balance bill amounts. Observed black-white differences in use thus may be partly due to differences in ability to pay.

While black-white differences in disease prevalence might explain differences in procedure use, the utilization differential has been found to persist, even when limited to patients with specific cardiac diagnoses such as AMI. Because there is little discretion in whether or not to admit patients with AMI, systematic differences in illness severity can be ruled out as a reason for black-white differences in procedure use. Over one-quarter (26 percent) of Medicare AMI patients die within 30 days of admission (Udvarhelyi et al., 1992), however, suggesting that some patients simply

may not live long enough to undergo these cardiac procedures. Previous research has not taken into account survival time when modeling the probability of use for black and white Medicare patients.

This article seeks to examine the role of limited ability to pay in explaining black-white treatment differences for AMI. In addition, we specifically adjust for the impact of differential mortality on the probability of use.

DATA AND METHODS

Sample Selection

As part of a larger study of the MFS, we had selected a sample of 2.7 million Medicare beneficiaries that oversampled those groups of beneficiaries believed to be particularly vulnerable to access barriers (Mitchell, 1994). These oversampled groups included black beneficiaries, the disabled, residents of physician shortage areas, and those living in poverty areas. The sample was restricted to Medicare beneficiaries continuously eligible in both Part A and Part B who were not enrolled in a health maintenance organization. From this larger sample, we used Medicare inpatient hospital claims (taken from the Medicare Provider Analysis and Review [MedPAR] files) to identify all patients admitted between January 1, 1992, and September 30, 1992, with a principal diagnosis of AMI *(International Classification of Diseases, 9th Revision, Clinical Modification* [ICD-9-CM] Code 410.x1). This yielded a sample size of 18,202 beneficiaries, including 2,658 black beneficiaries, considerably more than would have been selected with a simple random sample.[1] We then extracted all of their claims for a 90-day period beginning with the date of admission. Both ICD-9-CM procedure codes (from MedPAR claims) and *Current Procedural Terminology, 4th Edition* (CPT-4) procedure codes (from Part B claims) were used to identify the three procedures of interest: cardiac catheterization with angiography, CABG surgery, and PTCA. The use of both Part A and Part B claims to identify these procedures helps ensure a more complete count of procedure use.

Variable Construction

Sociodemographic characteristics, such as age, sex, race (white and black only), and geographic residence (ZIP Code), were obtained for all beneficiaries from the denominator file. No information was available on income level; instead, we proxied ability to pay with two measures: (1) dual Medicare/Medicaid eligibility (available from the denominator file); and (2) whether or not the beneficiary lived in a poverty area. Both of these measures capture the ability of low-income Medicare beneficiaries to pay for cardiac procedures; we were not able to proxy the ability of mid- to high-income beneficiaries to purchase private supplemental (medigap) coverage.

For those Medicare beneficiaries who are dually eligible, the State Medicaid program will pay the Medicare cost-sharing amounts (deductible and coinsurance) but not any balance bill amounts; the latter may make dual eligibles less desirable to those surgeons able to collect more than the MFS amount from their patients. Medicaid eligibility requirements vary considerably across States, and many low-income elderly do not qualify for dual coverage. We attempt to capture these low-income beneficiaries by whether or not they lived in a poverty area. A Medicare beneficiary was defined as living in a poverty area if he/she resided in a ZIP Code in which 30 percent or more of elder-

[1]Once the appropriate sampling weights are applied, black patients represent 6 percent of study AMI patients.

ly households were below the 1991 Federal poverty level (FPL) for a retired couple. Information on the 1991 income distribution of elderly households by ZIP Code were obtained from a commercial vendor of census data. Because the FPL is expressed in nominal dollars without any adjustment for geographic cost-of-living differences, we developed and applied a methodology for making this adjustment (Khandker and Mitchell, 1995).

Comorbidity for AMI patients was captured using secondary diagnoses on MedPAR claims. Dummy variables were created for selected chronic conditions that have been shown to increase patient risk of complications and/or adverse outcomes (Iezzoni et al., 1994) and presumably would reduce the probability of surgery. These conditions included: chronic pulmonary disease, congestive heart failure, diabetes mellitus with end organ damage, peripheral vascular disease, chronic renal failure, and functional impairment (such as paralysis). Other chronic conditions identified by Iezzoni et al., such as metastatic cancer, were not included in our analyses because of their very low prevalence in our sample of AMI patients.

Finally, the availability of both physician and hospital resources will influence the use of high-tech procedures. Most studies have used physician-population ratios to capture physician resources (available only at the county level), a measure that fails to capture the within-county variation in effective availability due to the residential segregation of the poor in inner city neighborhoods or remote rural locations. Instead, we examined whether or not patients lived in a physician shortage area. Shortage areas were constructed from the 1991 *Federal Register* list; this involved an extensive cross-walking from counties, census tracts, and other small geographic units to the beneficiary's ZIP Code of residence (see Mitchell, 1994 for more detail). Teaching hospitals and larger hospitals are more likely to offer cardiac catheterization labs and open heart facilities. Data on hospital teaching status and bed size were obtained from HCFA's Prospective Payment System Impact file.

Statistical Tests

Because of the complex nature of the sample design, weighting and standard error adjustments were required for all analyses. Simple differences between black and white AMI patients were tested, using chi-square and *t*-tests (as appropriate).

Our primary objective was to estimate the probability that a beneficiary would receive cardiac catheterization during the 90-day episode, and, conditional on having been catheterized, the probability that a beneficiary would undergo a coronary revascularization procedure (either PTCA or bypass surgery). Both dependent variables were binary, with zero indicating the absence of the procedure, and one indicating the presence. Logistic regression estimates the log odds ratio (which is the probability of having the procedure divided by the probability of not having it) as a function of the independent variables.

The independent variables included a set of demographic characteristics of the patient, including age and age squared (to represent an upward but declining propensity to have the procedure), sex, race, and residence in a rural area. Ability to pay was proxied by Medicaid eligibility and residence in a poverty area. Illness severity was measured by whether or not the beneficiary was originally eligible for Medicare because of disability and by selected chronic conditions. Resource availability was measured by residence in a physician shortage area, whether the hospital was a major (resident-bed ratio of 0.25 or

greater) or minor (resident-bed ratio greater than 0 but less than 0.25) teaching facility, and a series of dummy variables for hospital bedsize.

Except for patient age, all of the independent variables were categorical variables, e.g., black=1 if the patient was black and 0 if the patient was white. Thus, the reference (or comparison group) is always the group set equal to zero. Patient age (and age squared) were specified as continuous variables. The odds ratio associated with a continuous independent variable in a logistic regression can be interpreted as the change in the odds of receiving the procedure accompanying a one unit change in the independent variable—in this case, an increase of 1 year of age (Hosmer and Lemeshow, 1989).

We were particularly concerned about possible biases that might be introduced by the high mortality rates among AMI patients. There are two sources of potential bias. First, extremely sick patients, who are expected to die quickly, may not even be considered for surgery. Second, those that die are not observed for the full 90 days, thus truncating the time frame we have to observe procedure incidence for these patients. We sought to control for mortality by using a number of alternative measures and methods. Two measures of death status were constructed: (1) a dummy variable equal to one if the patient died during the 90-day episode; and (2) time until death (in days).

We first estimated logistic regressions without any adjustment for mortality. We then estimated the same regressions, this time including the alternative measures of mortality. Finally, we also ran separate logistic regressions for those AMI patients who died and those who did not die within 90 days of admission. The regressions based on patients who died also included alternative adjustments for time until death: actual time and predicted time (with the latter based on a separate equation regressing days until death on a set of patient characteristics).

DESCRIPTIVE RESULTS

Table 1 compares rates of the three cardiac procedures for black and white patients with AMI. Consistent with other studies, utilization rates for black patients were significantly lower than those of white patients for all three procedures. Low rates for PTCA and CABG surgery could be explained by the low use of cardiac catheterization among black patients; for this reason, we also examined use of these two procedures just for those patients who had undergone cardiac catheterization (also shown in Table 1). Even after limiting the sample to those patients eligible for surgery (by virtue of having been catheterized), black patients were still significantly less likely to receive either PTCA or bypass surgery. However, the relative size of the black-white differential was reduced. Black patients were only about 70 percent as likely to receive PTCA, compared with white patients (9.7/13.7), for example, based on the total sample of AMI patients; this declined to a differential of 83 percent

Table 1

Differences in Use of Cardiac Procedures by White and Black AMI Patients

Measure	White (n = 15,544)	Black (n = 2,658)
All Patients	Percent	
Cardiac Catheterization	39.0	*33.4
PTCA	13.7	*9.7
CABG Surgery	11.4	*6.6
For Patients Receiving Cardiac Catheterization		
PTCA	34.1	*28.3
CABG Surgery	28.4	*19.2

*Significantly different from white patients at the 0.01 level.

NOTES: AMI is acute myocardial infarction. PTCA is percutaneous transluminal coronary angioplasty. CABG is coronary artery bypass graft.

SOURCE: Center for Health Economics Research: Sample of Medicare patients hospitalized with AMI, January 1-September 30, 1992.

Table 2

Characteristics of White and Black Acute Myocardial Infarction Patients

Characteristic	White (n = 15,544)	Black (n = 2,658)
Sociodemographic Characteristics		
Age (Years)	75.0	**72.5
	Percent	
Male	51.9	**44.9
Dual Medicaid Eligible	12.0	**38.1
Lives in Poverty Area	5.7	**26.8
Lives in Physician Shortage Area	4.8	**15.9
Lives in Rural Area	31.4	**26.2
Comorbidity		
Chronic Pulmonary Disease	14.0	**11.3
Congestive Heart Failure	39.9	*41.7
Diabetes Mellitus With End Organ Damage	6.5	**10.7
Peripheral Vascular Disease	4.2	3.9
Chronic Renal Failure	2.0	**5.6
Functional Impairment	2.0	**3.7
Disability as Original Reason for Medicare Eligibility	14.4	**25.6
90-Day Mortality	24.4	24.2
Hospital Characteristics		
Teaching Status:[1]	—	**
Major Teaching Hospital	8.9	18.6
Minor Teaching Hospital	39.5	37.3
Non-Teaching Hospital	51.6	44.1
Bed Size:[1]	—	**
Less Than 100	12.3	10.4
100-199	17.9	14.6
200-299	22.8	22.3
300-399	16.5	17.8
400-503	13.6	11.9
504 or More	16.9	23.0

*Significantly different from white patients at the 0.05 level.
**Significantly different from white patients at the 0.01 level.

[1]Columns sum to 100 percent.

SOURCE: Center for Health Economics Research: Sample of Medicare patients hospitalized with acute myocardial infarction, January 1-September 30, 1992.

(28.3/34.1) when restricted to those undergoing cardiac catheterization.

Black patients with AMI may differ from their white counterparts in ways that affect the course of treatment, such as ability to pay, illness severity, and the types of hospitals where they receive care. Table 2 compares the characteristics of white and black patients along a number of dimensions. Black patients were somewhat younger and more likely to be female, compared with white patients. Most noticeably, their financial resources were more limited; black patients were significantly more likely to be Medicaid-eligible (38 percent versus 12 percent) and to live in a poverty area (26.8 percent versus 5.7 percent). They also were significantly more likely to live in a physician shortage area. White patients were more likely to live in rural areas, however.

There were definite differences in comorbidity between white and black AMI patients, although the differences were not always consistent. Black patients were almost twice as likely to originally have become eligible for Medicare because of disability, compared with white patients. While we have no way of identifying the type of disability, black patients were significantly more likely to suffer from chronic renal failure, suggesting that end stage renal disease may have been one reason for eligibility. Black patients with AMI also were more likely to have congestive heart

failure, diabetes with end organ damage, and functional impairment, compared with white patients. The prevalence of chronic pulmonary disease was significantly higher among white patients with AMI, on the other hand, and there were no significant differences by race in rates of peripheral vascular disease.

Almost one-quarter (24 percent) of all AMI patients, both black and white, died within 90 days of admission. This high mortality rate reinforces the need to control for this potential source of bias in our analysis of procedure use. Although there were no differences in mortality by race, black and white patients did differ along key characteristics that may affect mortality (e.g., age, comorbidity, etc.). Thus, adjustment for mortality could still affect relative black-white procedure rates, once we hold these other characteristics constant.

There were marked differences by race in the types of hospitals where AMI patients were treated. Black AMI patients were significantly more likely to be admitted to large hospitals and to major teaching facilities. In part, this may reflect their disproportionate urban residence.

The more limited financial resources of black AMI patients may be a factor in their lower use of cardiac procedures. At the same time, they are more likely to be treated in precisely those hospitals where such procedures are widely available (namely, large teaching institutions). Multivariate techniques will enable us to determine the net effect of race on procedure use.

MULTIVARIATE RESULTS

Table 3 shows the odds ratios for procedure use from four logistic regression models. In this table, mortality is defined as a categorical variable (=1 if the patient died within 90 days and 0 otherwise). The first two columns model the probability of cardiac catheterization for all AMI patients, first with adjustment for all covariates except mortality and then adjusted for mortality as well. The second two columns model the probability of revascularization for that subset of patients who received cardiac catheterization (n = 6,204), without and with mortality adjustment.

The first row compares the odds ratios associated with being black (a dummy variable set equal to 1 for black patients and 0 for white patients). After adjusting for patient, illness, and hospital characteristics (but not mortality), black patients were only 67.7 percent as likely to undergo cardiac catheterization, compared with white patients. Adjusting for death has no appreciable impact on the black-white use differential (odds ratio equal to 0.663, compared with 0.677 unadjusted). As we can see from the bottom of Table 3, however, death itself is an important negative predictor of use. AMI patients who died during the episode were only one-fourth (28 percent) as likely to undergo cardiac catheterization as were those who survived.

Low rates of revascularization persist for black AMI patients, even after adjusting for our ability-to-pay measures and other factors. Black AMI patients who had already been catheterized were only 60.5 percent as likely to undergo a revascularization procedure, compared with otherwise similar white patients. Although not nearly as dramatic as the probability of receiving cardiac catheterization, AMI patients who died also were significantly less likely to undergo revascularization.

What about other variables affecting procedure use for AMI patients? The probability of undergoing either cardiac catheterization or revascularization increases with age but at a decreasing rate, as indicated by the odds ratios greater than one and less than one, respectively, for the linear and quadratic forms of the age variables. Consistent with

Table 3

Odds Ratios From Logistic Regression Models Predicting Procedure Use With and Without Adjustment for Mortality

Covariates	Cardiac Catheterization (All Patients; n =18,202)		Revascularization (Patients With Cardiac Catheterization; n = 6,204)	
	Adjusted for All Covariates Except Mortality	Adjusted for Mortality	Adjusted for All Covariates Except Mortality	Adjusted for Mortality
Black	**0.677	**0.663	**0.605	**0.602
Age	**1.337	**1.343	**1.068	**1.066
Age^2	**0.997	**0.997	**0.999	**1.000
Male	**1.245	**1.215	1.023	1.016
Dual Medicaid Eligible	**0.699	**0.690	**0.815	**0.815
Poverty Area	**0.748	**0.737	**0.850	**0.849
Physician Shortage Area	0.967	0.939	0.954	0.952
Rural Area	**1.469	**1.489	**1.084	**1.084
Disabled	**0.655	**0.680	**0.818	**0.822
Chronic Pulmonary Disease	**0.756	**0.728	*1.101	*1.104
Congestive Heart Failure	**0.454	**0.488	**0.732	**0.741
Diabetes With End Organ Damage	**0.657	**0.723	0.950	0.962
Peripheral Vascular Disease	*0.892	**0.851	0.968	0.972
Chronic Renal Failure	**0.316	**0.400	*1.401	*1.436
Functional Impairment	**0.435	**0.441	**0.297	**0.293
Major Teaching	**1.988	**2.024	0.969	0.972
Minor Teaching	**1.353	**1.368	0.963	0.964
Bedsize:				
100-199	**3.270	**3.437	1.103	1.108
200-299	**9.364	**10.045	**1.609	**1.629
300-399	**14.990	**16.297	**2.593	**2.628
400-503	**16.954	**18.232	**2.435	**2.461
504 or More	**22.452	**24.795	**2.590	**2.624
Death (Yes/No)	—	**0.276	—	**0.845

*$p < 0.05$.
**$p < 0.01$.

SOURCE: Center for Health Economics Research: Sample of Medicare patients hospitalized with acute myocardial infarction, January 1-September 30, 1992.

other literature (e.g., Udvarhelyi et al., 1992), male patients admitted with AMI were more likely to undergo cardiac catheterization than otherwise similar female patients. Controlling for catheterization, however, there were no differences by gender in the probability of revascularization. This is inconsistent with Ayanian et al., (1993) who found that women were less likely to receive either PTCA or CABG surgery after catheterization. One explanation may be that the Ayanian study included patients with any coronary heart disease, while our study focused exclusively on AMI patients. We also controlled for additional factors that may be correlated with gender, such as residence in poverty areas and disability status.

Limited ability to pay definitely lowers the probability of use. AMI patients who were Medicaid-eligible or who lived in poverty areas were significantly less likely to undergo cardiac catheterization and, if catheterized, were less likely to receive revascularization procedures. While not as large as the black-white utilization gap, the differential based on ability to pay is still considerable. Medicaid-eligible AMI patients were only 70 percent as likely to undergo cardiac catheterization as those who were not eligible, for example, and AMI patients living in poverty areas only 75 percent as likely as otherwise similar patients living in non-poverty areas. This impact of lim-

Table 4

Adjusted Black-to-White Odds Ratios for Cardiac Procedure Use With Alternative Adjustments for Mortality[1]

Mortality Adjustment	Cardiac Catheterization (All Patients; n = 18,202)	Revascularization (Patients With Cardiac Catheterization; n = 6,204)
Death (Yes/No)	*0.663	*0.602
Days Until Death	*0.679	*0.604
Survivors Only	*0.678	—
Deaths Only	*0.567	—
Deaths Only, Adjusting for Days Until Death	*0.549	—
Deaths Only, Adjusting for Predicted Days Until Death	*0.554	—

*Significantly different from white patients at the 0.01 level.

[1]From logistic regression models that adjusted for patient's age, sex, comorbidity, dual Medicaid eligibility, residence in poverty area, physician shortage area, or rural area (respectively), hospital teaching status, and bed size.

SOURCE: Center for Health Economics Research: Sample of Medicare patients hospitalized with acute myocardial infarction, January 1-September 30, 1992.

ited ability to pay is independent of race; interaction terms of these variables with race were insignificant.

Residence in a physician shortage area had no effect on utilization, but residence in a rural area increased the probability of use. This is surprising, but it should be noted that we have controlled for hospital characteristics (bed size and teaching status). When hospital characteristics were excluded from the regression, AMI patients living in rural areas were less likely to undergo these cardiac procedures.

As expected, entitlement to Medicare due to disability or a diagnosis of any one of six chronic conditions associated with poor outcomes lowered the probability of undergoing cardiac catheterization. With two exceptions, these same variables lowered the probability of receiving a revascularization procedure. Patients with a secondary diagnosis of either chronic pulmonary disease or chronic renal failure were significantly more likely to undergo revascularization. Since patients with these same conditions were less likely to have been catheterized in the first place, presumably this subset represents a relatively healthier group of patients who have been deemed stable enough for surgery.

Being treated in a teaching institution or in a relatively larger hospital greatly increases the probability of cardiac catheterization.[2] We assume that these characteristics are capturing the availability of cardiac facilities. AMI patients treated in hospitals with 200 beds or more also were more likely to undergo revascularization procedures.

Table 4 compares the black-to-white odds ratios from logistic regressions, using alternative specifications of mortality.[3] The odds ratios shown in the first row (death [yes/no]) are the same as those displayed for the variable "Black" shown in Table 3. As can be seen, the results proved to be insensitive to which specification we used. Using a categorical (yes/no) measure of mortality, black patients were 66.3 percent as likely to undergo cardiac catheterization; substituting a continuous measure (days until death), for example, black patients were 67.9 percent as likely. Among

[2]The hospital characteristics are those of the hospital in which the patient was treated for the AMI. Some patients may have undergone the actual procedure(s) in a different hospital (during a subsequent admission).

[3]We did not estimate the revascularization equation for deaths and survivors separately because of the relatively small number of deaths in this subsample.

those who died, black patients were even less likely to undergo cardiac catheterization compared with white patients (55-57 percent). This is clearly a different sample of patients, however, and hence the odds ratios will be somewhat different from those models based on deaths and survivors combined.

CONCLUSIONS

Previous studies using Medicare claims data from the 1980s have found pronounced differences in the use of high-tech cardiac procedures between white and black beneficiaries, even when limited to patients with specific cardiac diagnoses. Using more recent (1992) data, we have confirmed those findings in a sample of Medicare patients admitted with AMI. Black patients were significantly less likely to undergo cardiac catheterization and, even if catheterized, were significantly less likely to receive a coronary revascularization procedure (either PTCA or CABG surgery) during the 90-day period following admission. While black AMI patients did have more limited financial resources, as measured by dual Medicaid eligibility and residence in poverty areas, this difference in ability to pay did not explain the utilization gap between black and white patients.

There are many phases during the treatment process that could lead to these black-white differences in procedure use. The decision to operate (or not) may be made during the initial AMI hospitalization, following transfer to another facility, or at some time after discharge. A recent California study suggests that minority patients (including both blacks and Hispanics) were less likely to undergo revascularization at each one of these steps (Blustein, Arons, and Shea, 1995). Not examined by either their study or our own, however, is what role patient decisionmaking may play. Horner, Oddone, and Matchar (1995) have noted, for example, that blacks and whites may vary in their thresholds for seeking care, their compliance with physician recommendations, and their beliefs regarding illness and treatment.

The very high mortality rate among AMI patients may introduce bias in observed utilization rates by truncating the time period during which a procedure may be performed, a complicating factor not addressed in previous studies. We controlled for mortality using a number of alternative approaches. While death had a significant impact on the probability of procedure use, it did not explain black-white differences in use. The black-to-white odds ratios remained relatively stable, regardless of whether or not we adjusted for mortality and regardless of which mortality adjustment was employed.

These findings suggest that researchers must continue to search for other factors that may explain these large black-white differentials in use. Although we attempted to capture ability to pay, more accurate measures of beneficiary income or private supplemental coverage might have helped narrow the utilization gap. Nevertheless, our measures of ability to pay have documented for the first time that, regardless of a patient's race, their limited financial resources affect the probability of receiving cardiac procedures. AMI patients who were dually eligible and AMI patients who resided in poverty areas were significantly less likely to undergo either cardiac catheterization or revascularization, compared with non-Medicaid eligibles and non-poverty area residents, respectively. Unlike other poor elderly, dual eligibles are not liable for Medicare deductibles and copayments. However, our study suggests that Medicaid's cost-sharing arrangements are not sufficient to guarantee equal use of cardiac procedures, and that both financial

and non-financial barriers to care still may exist for this subset of patients. More research, especially with regard to the role of patient decisionmaking, is needed to determine the reasons behind these differences in treatment.

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Reprint Requests: Janet B. Mitchell, Ph.D., President, Center for Health Economics Research, 300 Fifth Avenue, 6th Floor, Waltham, Massachusetts 02154.