Racial and Ethnic Differences in the Use of Cardiovascular Procedures: Findings From the California Cooperative Cardiovascular Project

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ABSTRACT

Objectives. This study used data from the California Cooperative Cardiovascular Project to examine the use of invasive and noninvasive cardiovascular procedures among Whites, African Americans, and Hispanics.

Methods. The use of catheterization, percutaneous transluminal coronary angioplasty (PTCA), coronary artery bypass graft (CABG) surgery, and several noninvasive tests among all patients 65 years or older with a confirmed acute myocardial infarction in nonfederal hospitals from 1994 to 1995 was studied.

Results. African Americans (n = 527) were less likely than Whites (n = 9489) to have received catheterization (adjusted odds ratio [OR] = 0.62, 95% confidence interval [CI] = 0.50, 0.76), PTCA (OR = 0.64, 95% CI = 0.49, 0.85), or CABG surgery (OR = 0.42, 95% CI = 0.27, 0.64); somewhat more likely to have received a stress test or an echocardiogram; and equally likely to have received a multiple-gated acquisition scan. Hispanics (n = 689) also were less likely than Whites to have received catheterization (OR = 0.82, 95% CI = 0.68, 0.98) or PTCA (OR = 0.58, 95% CI = 0.45, 0.75).

Conclusions. African Americans were less likely than Whites to undergo costly invasive cardiovascular procedures. In addition, Hispanics were less likely than Whites to have received catheterization and PTCA. (*Am J Public Health*. 2000;90:1128–1134)

African Americans are less likely than Whites to undergo various invasive cardiovascular procedures for coronary artery disease, including cardiac catheterization, percutaneous transluminal coronary angioplasty (PTCA), and coronary artery bypass graft (CABG) surgery.[1–39] Furthermore, African Americans admitted to the hospital with an acute myocardial infarction were less likely than Whites to be treated with thrombolytic therapy,[26,40] although no difference in treatment has been shown in other settings.[8,24,28,34] In recent years, several publications have suggested that Hispanics also may undergo fewer cardiac procedures than do Whites.[22,26,28,30,33,35,36] Reasons for this disparity remain unclear, but it appears unlikely that socioeconomic factors fully explain the racial differential.[41]

Many early studies used data from large administrative databases that did not contain detailed information on the severity of the acute myocardial infarction or other clinical factors. Thus, racial differences in clinical factors could have accounted for some of the reported differences in the use of cardiac procedures. Racial differences persisted, however, when various comorbidities and clinical variables related to severity of disease, prognosis, or contraindication to procedures were included in the analyses.[1,32,34,36]

The Cooperative Cardiovascular Project (CCP) was designed to collect data that would lead to improvements in the quality of care for acute myocardial infarction among Medicare beneficiaries. Over a 2-year period, data were abstracted for more than 200 000 patients with an acute myocardial infarction discharged from hospitals in the United States. We examined whether racial or ethnic differences in the use of invasive and several noninvasive procedures existed among elderly patients admitted for treatment of an acute myocardial infarction in California.

Methods

Patient Population

Details about the methods of the CCP were published previously.[42] In brief, between 1994 and 1995, the medical records of 17 095 patients admitted to 1 of 383 nonfederal, acute-care California hospitals for treatment of an acute myocardial infarction were abstracted. Medicare patients with a discharge diagnosis of acute myocardial infarction (*International Classification of Diseases, Ninth Revision, Clinical Modification* code 410[43]) were identified from the Medicare Provider Analysis and Review Record. Two contractors requested copies of medical records and abstracted information on admitting variables, variables concerning the hospitalization stay, and discharge variables. In addition, 30-day mortality rates were obtained from databases of the Social Security Administration.

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An acute myocardial infarction was confirmed if

- The highest lactate dehydrogenase concentration was greater than 1.5 times the upper limit of normal and the lactate dehydrogenase–1 concentration exceeded the lactate dehydrogenase–2 concentration.
- The peak creatine kinase–MB isoenzyme was greater than 5%.
- Two of the following 3 criteria were met: (1) The ratio of peak creatine kinase to the creatine kinase upper limit of normal was greater than 2. (2) The patient had angina or chest discomfort within 2 days of arrival. (3) Myocardial infarction was diagnosed with electrocardiography by ST elevation in 2 or more contiguous leads, with new transmural myocardial infarction, or with new myocardial infarction or injury.

Study Variables

The invasive cardiovascular procedures performed during the hospitalization stay that we included were cardiac catheterization, PTCA, and CABG surgery. The noninvasive procedures were multiple-gated acquisition scan, stress test (exercise and drug), and echocardiogram. Covariates are listed in Tables 1 to 3.

Data Analysis

We limited our analyses to the 10 705 patients with a confirmed acute myocardial infarction who were 65 years or older and who were not transferred to another hospital. We included only White, African American, and Hispanic patients in our analysis. Race or ethnicity was abstracted from the medical charts.

From the many potential confounders, we chose variables that differed among the 3 racial and ethnic groups and that differed between patients who received a particular procedure and those who did not. The statistical significance of these univariate analyses was tested with χ^2 analysis for categoric variables and analysis of variance for continuous variables. If the differences for both sets of comparisons were significant or borderline significant, we included that variable in the multiple logistic regression analyses in which the various procedures were the dependent variables and race or ethnicity was an independent variable along with other covariates.

Results

After we applied the exclusion criteria noted above, data from 9489 Whites, 527 African Americans, and 689 Hispanics were available for analysis. Missing data for the dependent and independent analyses resulted in further reductions in sample size for specific analyses.

TABLE 1—Characteristics of Patients Admitted to the Hospital With an Acute Myocardial Infarction, by Race and Ethnicity: California Cooperative Cardiovascular Project, 1994–1995

	White (n = 9489), %[a]	African American (n = 527), %	Hispanic (n = 689), %	*P*
Age, y				.001
65–69	17.8	24.1	28.5	
70–74	22.6	29.0	24.5	
75–79	21.5	21.1	16.1	
80–84	19.3	13.5	16.7	
≥85	18.9	12.3	14.2	
Men	53.8	43.8	53.4	.001
Current smoker	12.4	15.2	11.2	.099
Medical history				
Diabetes	26.5	40.2	51.5	.001
Hypertension	61.1	80.7	69.2	.001
Cerebrovascular accident	13.9	17.8	20.5	.001
Chronic obstructive pulmonary disease	21.1	18.8	16.7	.012
Active ulcer disease	12.8	16.3	13.8	.050
History of internal bleeding	8.4	8.0	8.3	.930
History of bleeding disorder	0.4	0.2	0.4	.703
History of terminal illness	0.4	0.0	0.4	.319
Dementia or Alzheimer disease	6.6	6.1	4.5	.094
History of trauma	3.5	3.4	2.6	.475
History of myocardial infarction	29.4	30.9	28.5	.638
History of angina	55.2	55.4	53.0	.513
Peripheral vascular disease	10.9	13.9	13.6	.011
History of congestive heart failure	21.9	27.5	26.0	.001
Previous percutaneous transluminal coronary angioplasty	8.6	7.4	7.0	.212
Previous coronary artery bypass surgery	15.1	10.8	11.2	.001
Other previous cardiovascular surgery	2.1	1.1	1.9	.296
Other comorbidity	4.3	3.0	3.2	.149

[a]Because of missing data, percentages and means may be based on a sample size that differs from that listed.

Numerous differences in study variables existed among the 3 groups (Tables 1–3). The crude comparisons suggested that African American patients were less likely than Whites to have received cardiac catheterization, PTCA, or CABG surgery and that Hispanic patients were less likely than Whites to have received cardiac catheterization or PTCA.

After adjustment for various demographic, medical history, and admission variables related to disease severity, African Americans were less likely than Whites to have received cardiac catheterization, PTCA, or CABG surgery; more likely to have received a stress test or an echocardiogram; and as likely to have received a multiple-gated acquisition scan during their hospitalization (Table 4). Hispanic patients were less likely than Whites to have received catheterization or PTCA but not CABG surgery, an echocardiogram, a stress test, or a multiple-gated acquisition scan. Generally, we obtained similar results when we conducted analyses in subgroups of patients who were more likely to have been eligible for the various invasive procedures. Refusal rates for cardiac catheterization were 1.8% for Whites, 1.5% for African Americans, and 2.3% for Hispanics ($P=.554$).

We also examined the mean time to having a procedure. Among persons receiving a procedure, the mean time to having a cardiac catheterization differed significantly among the 3 groups, with White patients having the shortest time ($P<.0001$). The difference in the mean time to having a CABG surgery was nearly significant, with White patients having the shortest time ($P=.0551$) (Table 5).

Thirty-day mortality rates did not differ significantly among the 3 groups. Crude mortality rates were 20.2% for Whites, 19.4% for African Americans, and 20.8% for Hispanics. Based on 10 703 patients and 2166 deaths, the age- and sex-adjusted odds ratios (ORs) for dying within 30 days of ad-

TABLE 2—Admission Characteristics of Patients Hospitalized With an Acute Myocardial Infarction, by Race and Ethnicity: California Cooperative Cardiovascular Project, 1994–1995

	White (n = 9489), %[a]	African American (n = 527), %	Hispanic (n = 689), %	*P*
APACHE II score[b]	9.99	10.56	10.26	.001
MMPS score[b]	0.2042	0.1966	0.1993	.570
Length of stay, d	6.7	7.8	7.3	.034
Left ventricular ejection fraction	45.2	43.9	43.4	.013
Arrival findings				
Cardiac arrest (up to 6 h before arrival)	4.4	5.1	5.1	.492
Shock	3.6	3.0	2.8	.419
Hemorrhage (up to 48 h before arrival)	3.1	3.8	4.6	.056
Congestive heart failure or pulmonary edema	29.0	33.6	33.2	.006
Rales	33.6	35.9	37.9	.046
Gallop rhythm or S_3	3.1	4.0	4.4	.107
Angina or chest pain (up to 48 h before arrival)	81.1	77.2	79.0	.040
Angina at arrival lasting ≥60 min after arrival	29.6	28.3	28.3	.657
Time since chest pain, h				
Undetermined	3.5	3.2	5.7	.013
<6	50.8	49.2	46.0	
6–12	9.3	8.2	9.6	
>12	17.8	17.1	17.0	
No chest pain	18.6	22.4	21.8	
Admission electrocardiogram				
Q wave myocardial infarction	16.4	12.4	15.0	.045
Anterior myocardial infarction	46.2	48.8	45.3	.448
Ventricular tachycardia	0.8	1.2	0.5	.385
Atrial fibrillation	11.7	7.7	8.5	.001
Left bundle-branch block	7.2	4.9	5.1	.023
Right bundle-branch block	9.0	7.1	7.7	.180
Old bundle-branch block	6.1	4.7	5.1	.266
Second- or third-degree heart block	1.5	1.0	1.4	.639
Pacemaker rhythm	2.3	2.2	2.4	.959

Note. APACHE = Acute Physiology and Chronic Health Evaluation; MMPS = Medicare Mortality Prediction System.
[a]Because of missing data, percentages and means may be based on a sample size that differs from that listed.
[b]Means.

mission were 1.04 (95% confidence interval [CI] = 0.82, 1.30) for African Americans and 1.14 (95% CI = 0.94, 1.39) for Hispanics. After multiple adjustments for numerous potential confounders (age, sex, smoking status, Acute Physiology and Chronic Health Evaluation [APACHE] II score, ejection fraction, comorbidities, various clinical events shortly before or at admission, complications during the hospitalization course, and abnormalities on the electrocardiogram recorded at arrival to the hospital), the odds ratios were 0.87 (95% CI = 0.59, 1.27) for African Americans and 0.99 (95% CI = 0.72, 1.37) for Hispanics (994 deaths among 6519 patients).

The percentages of patients who were transferred were 16.6%, 12.0%, and 17.3% of the Whites, African Americans, and Hispanics, respectively. Patients who were transferred were younger, were more likely to be male, had fewer comorbidities, had fewer complications before or at the time of admission, had lower APACHE II scores, had more angina or chest pain after admission, and were more likely to have been treated with thrombolytic agents and aspirin, but were less likely to have been treated with β-blockers, than patients who were not transferred. Furthermore, patients who were transferred were less likely to have received a multiple-gated acquisition scan, a stress test, cardiac catheterization, PTCA, or CABG, but not an echocardiogram, than patients who were not transferred.

Discussion

As early as 1984, Oberman and Cutter reported that African Americans were less likely than Whites to undergo invasive cardiac procedures.[1] More than a decade later, our analysis showed that African Americans still receive fewer invasive cardiac procedures than do Whites. Other analyses of Medicare data sets also have found that African Americans were less likely to receive various invasive cardiac procedures than were Whites.[10–14,18,19,25] However, the clinical data available in the CCP were not available to earlier investigators of Medicare data. Use of the CCP data allowed us to better adjust for differences in disease severity and other clinical factors that may have affected the frequency of procedures among the various racial or ethnic groups.

Less is known about the use of cardiac procedures among Hispanics in the United States. The data from the California CCP showed that Hispanics were less likely than Whites to undergo cardiac catheterization and PTCA but were equally likely to undergo CABG surgery. Thus, the deficits in the use of cardiac procedures among Hispanics in California compared with Whites are not as striking as those among African Americans.

African Americans were more likely to have a stress test or an echocardiogram than the other 2 groups. Previous studies have reported mixed findings about the use of exercise testing and echocardiography among Whites and African Americans.[13,29] Results from noninvasive tests could be responsible in part for differences in the more invasive diagnostic procedures and treatment pat-

TABLE 3—Stay Characteristics of Patients Hospitalized With an Acute Myocardial Infarction, by Race and Ethnicity: California Cooperative Cardiovascular Project, 1994–1995

	White (n = 9489), %[a]	African American (n = 527), %	Hispanic (n = 689), %	*P*
Events during hospitalization				
Cerebrovascular accident	3.1	5.5	3.5	.009
Decubitus ulcer	2.5	3.2	3.1	.357
Deep vein thrombosis	0.7	0.4	0.7	.719
Pneumonia	9.9	11.0	12.3	.096
Cardiac arrest	13.6	12.5	14.5	.605
Brain anoxia	3.0	3.0	2.5	.745
Hypotension	24.6	20.9	26.1	.091
Bradycardia	27.9	25.8	30.0	.257
Shock	10.7	7.8	10.7	.107
Extension or reinfarction	3.2	2.9	2.2	.305
Congestive heart failure or pulmonary edema	44.7	45.2	47.6	.319
Chest pain 6–24 h after admission	19.8	22.8	18.9	.196
Chest pain >24 h after admission	22.0	23.2	22.5	.782
Hemorrhage	11.2	10.8	13.6	.136
Intubation	13.8	14.8	17.9	.011
Transfusion	15.9	13.9	18.6	.071
Electrocardiogram findings during stay				
Myocardial infarction	78.4	73.2	77.9	.020
Ischemia >48 h after arrival	19.2	22.4	24.5	.001
Atrial fibrillation	22.9	17.5	16.3	.001
Left bundle-branch block	10.0	8.9	8.9	.461
Right bundle-branch block	13.1	10.6	11.3	.127
Left fascicular block	14.2	14.2	14.2	1.000
Second- or third-degree heart block	4.6	3.6	5.2	.405
Refused catheterization	1.8	1.5	2.3	.554
Procedures done during stay				
Multiple-gated acquisition scan	2.7	3.4	2.8	.627
Echocardiography	53.1	58.6	55.0	.031
Stress test	13.2	16.9	12.8	.047
Cardiac catheterization	38.2	29.4	35.1	.001
Percutaneous transluminal coronary angioplasty	17.8	12.7	12.1	.001
Coronary artery bypass graft surgery	9.7	4.6	10.6	.001

[a]Because of missing data, percentages and means may be based on a sample size that differs from that listed.

terns.[21] In this study, the proportions of Hispanic and White patients receiving a noninvasive test were similar.

The explanations offered to account for these racial differences have included differences in disease prevalence, disease severity, patients' clinical presentation, noninvasive test results, socioeconomic or insurance status, acceptance of invasive procedures,[2] access to medical care, the medical decision-making process, physicians' beliefs regarding outcomes of CABG surgery, racial or cultural biases of the treating physicians,[21,41,44] lower referral rates for cardiac procedures,[37] and higher refusal rates by African Americans.[2,37] The CCP data allowed us to discount but not completely eliminate differences in disease prevalence, socioeconomic or insurance status, access to medical care, and the acceptance of cardiac catheterization. Because we conducted our analyses among Medicare beneficiaries, economic issues are less likely to constitute a plausible explanation for our findings, although the ability to make copayments and supplemental insurance coverage could be important issues. The data from the California CCP showed that the documented refusal rate for catheterization was low and did not differ significantly according to race.

Some studies have indeed suggested that many inappropriate cardiac procedures are performed,[45–47] whereas other, more recent studies have come to different conclusions.[48–50] One study suggested that African American patients were less likely than White patients to receive either PTCA or CABG surgery when clinically indicated, suggesting that underuse among African Americans rather than overuse among Whites is more likely.[33]

Several studies have suggested that despite receiving fewer invasive procedures, African Americans who sustain an acute myocardial infarction have a short- and intermediate-term mortality similar to that of White patients,[11,21,31,51] although long-term mortality may be higher among African Americans.[37] The California CCP showed that 30-day mortality rates were similar in all 3 groups. Because several reports have suggested that African Americans stand to benefit from invasive procedures,[36,52] long-term mortality may be compromised by the failure to receive various invasive cardiac interventions that could help preserve the threatened myocardium early on.[25]

The CCP data offer several advantages over other data sets for examining racial differences in the use of cardiac procedures. All patients had a documented acute myocardial infarction, thus eliminating possible effects of inclusion of patients with other conditions that could cause chest pain or mimic coronary heart disease and differences in the prevalence of coronary heart disease. Information on a host of variables related to admission and the clinical course of patients in the hospital was collected, allowing more careful control of potential confounding variables.

Various limitations of the CCP data set also must be acknowledged. Although the CCP data set is not purely administrative, it shares some problems with administrative data sets, such as the difficulty of documenting episodes of patient care, especially for patients who are transferred to another hospital and receive their care at different hospitals. Chart abstractions were limited to the data contained in the charts; thus, for some variables, the completeness and accuracy of the information are unknown.

Socioeconomic data were not included in the data set. Although financial barriers should have played less of a role in determining who might have received a cardiac procedure, it is nevertheless plausible that if copayments played a role, financial means could have influenced physician decision making.

The timing of some of the variables, especially those related to events during the hospitalization stay, was difficult to establish. Thus, certain events that may have affected a patient's chance of getting a cardiac procedure may have occurred after, rather than before, the procedure. The race and ethnicity designation was abstracted from the chart, raising the question of whether race or ethnicity was self-designated or assigned by a medical recorder. Severity of disease in terms of coronary anatomy could not be adequately documented. For some variables, such as left ventricular ejection fraction, significant amounts of data were missing. Fi-

TABLE 4—Rate of Cardiac Interventions Among Patients Hospitalized With an Acute Myocardial Infarction, by Race and Ethnicity: California Cooperative Cardiovascular Project, 1994–1995

	No. of Procedures	n	Crude Rate, %	Crude Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)[a]
Multiple-gated acquisition scan					
White	257	9489	2.7	1.00	1.00
African American	18	527	3.4	1.27 (0.78, 2.07)	1.24 (0.76, 2.03)
Hispanic	19	689	2.8	1.02 (0.64, 1.63)	0.92 (0.57, 1.48)
Total	294	10705	2.8		
Echocardiogram					
White	5035	9489	53.1	1.00	1.00
African American	309	527	58.6	1.25 (1.05, 1.50)	1.26 (1.05, 1.52)
Hispanic	379	689	55.0	1.08 (0.93, 1.26)	1.06 (0.91, 1.24)
Total	5723	10705	53.5		
Stress test					
White	1252	9489	13.2	1.00	1.00
African American	89	527	16.9	1.34 (1.06, 1.69)	1.35 (1.05, 1.74)
Hispanic	88	689	12.8	0.96 (0.76, 1.21)	0.98 (0.77, 1.25)
Total	1429	10705	13.3		
Cardiac catheterization					
White	3620	9489	38.1	1.00	1.00
African American	155	527	29.4	0.68 (0.56, 0.82)	0.62 (0.50, 0.76)
Hispanic	242	689	35.1	0.88 (0.75, 1.03)	0.82 (0.68, 0.98)
Total	4017	10705	37.5		
PTCA					
White	1690	9489	17.8	1.00	1.00
African American	67	527	12.7	0.67 (0.52, 0.87)	0.64 (0.49, 0.85)
Hispanic	83	689	12.1	0.63 (0.50, 0.80)	0.58 (0.45, 0.75)
Total	1840	10705	17.2		
CABG surgery					
White	917	9489	9.7	1.00	1.00
African American	24	527	4.6	0.45 (0.29, 0.68)	0.42 (0.27, 0.64)
Hispanic	73	689	10.6	1.11 (0.86, 1.43)	0.92 (0.70, 1.22)
Total	1014	10705	9.5		

Note. CI = confidence interval; PTCA = percutaneous transluminal coronary angioplasty; CABG = coronary artery bypass graft.

[a]Multiple-gated acquisition scan model was adjusted for age, sex, transfusions, ischemia >48 hours after arrival.

Echocardiography model was adjusted for age, sex, history of chronic obstructive pulmonary disease, congestive heart failure, CABG surgery, congestive heart failure during stay, rales during stay, chest pain during stay, duration of chest pain, pneumonia, transfusion, myocardial infarction, ischemia less than 48 hours after arrival, and atrial fibrillation.

Stress-test model was adjusted for age, sex, comorbidity, history of cerebrovascular accident, chronic obstructive pulmonary disease, dementia, peripheral vascular disease, congestive heart failure, hemorrhage (up to 48 hours before arrival), congestive heart failure during stay, rales during stay, S_3 gallop, chest pain during stay, duration of chest pain, cerebrovascular accident in hospital, pneumonia, intubation, transfusion, atrial fibrillation on admission electrocardiogram, left bundle-branch block, atrial fibrillation during stay, and ischemia less than 48 hours after arrival.

Cardiac catheterization model was adjusted for age, sex, current smoking, comorbidity, history of hypertension, diabetes, cerebrovascular accident, chronic obstructive pulmonary disease, dementia, peripheral vascular disease, congestive heart failure, CABG surgery, hemorrhage (up to 48 hours before arrival), congestive heart failure during stay, rales during stay, S_3 gallop, chest pain during stay, duration of chest pain, atrial fibrillation on admission electrocardiogram, and left bundle-branch block.

Percutaneous transluminal coronary angioplasty model was adjusted for age, sex, current smoking, comorbidity, history of hypertension, cerebrovascular accident, chronic obstructive pulmonary disease, dementia, peripheral vascular disease, congestive heart failure, hemorrhage (up to 48 hours before arrival), congestive heart failure during stay, rales during stay, S_3 gallop, chest pain during stay, duration of chest pain, atrial fibrillation on admission electrocardiogram, and left bundle-branch block.

Coronary artery bypass graft surgery model was adjusted for age, sex, current smoking, history of hypertension, cerebrovascular accident, dementia, congestive heart failure, previous coronary artery bypass graft surgery, hemorrhage (up to 48 hours before arrival), congestive heart failure during stay, rales during stay, chest pain during stay, duration of chest pain, atrial fibrillation on admission electrocardiogram, and left bundle-branch block.

nally, African Americans or Hispanics may have received proportionately more of the procedures for which they showed a deficit after their discharge from the hospital than did White patients.

In summary, African Americans were less likely than Whites to have received cardiac catheterization, PTCA, or CABG surgery during their stay in the hospital for an acute myocardial infarction. Hispanics were less likely than Whites to have received cardiac catheterization or PTCA but not CABG surgery. Four possible reasons for these differences—differences in socioeconomic or insurance status, disease severity or comorbidities, access to medical care, and refusal rates—are less likely explanations for the findings than are interpersonal or cultural factors that affect the patient–physician interaction.

Other studies specifically designed to examine these differences are needed. For example, focus group studies of physicians and patients who did not have certain indicated cardiac or other procedures may yield new hypotheses and explanations for the racial and ethnic disparities. Although some data

TABLE 5—Mean Time Between Arrival at Hospital and Receipt of Cardiac Procedure, by Race and Ethnicity: California Cooperative Cardiovascular Project, 1994–1995

	White		African American		Hispanic			Total	
From arrival to	n	Mean Time	n	Mean Time	n	Mean Time	P^b	n	Mean Time
Cardiac catheterization	3022	2216	116	3010	188	2527	.0001	3326	2261
25th percentile		180		1282		250			188
50th percentile		1584		2836		2313			1621
75th percentile		3841		5074		4219			3890
PTCA	1303	1964	38	2240	66	2039	.7101	1407	1975
25th percentile		162		186		200			166
50th percentile		1145		1509		1266			1158
75th percentile		3388		4153		3556			3430
CABG	887	5567	22	6384	71	6252	.0551	980	5635
25th percentile		1290		2490		1327			1299
50th percentile		4046		6152		5235			4110
75th percentile		7115		8880		9870			7320

Note. Time is expressed in minutes. PTCA = percutaneous transluminal coronary angioplasty; CABG = coronary artery bypass graft.
[b]*P* from Kruskal–Wallis test.

suggested that racial and ethnic differences in the use of cardiac procedures narrowed during the late 1980s and 1990s,[18,28,32] our results show that important differences remain. Thus, specific interventions are needed to accelerate the narrowing of this gap. Meanwhile, those who are influential in determining standards of care, whether in the private or government sector, are responsible for ensuring that medical care is equitably offered and delivered to patients. □

Contributors

All of the authors contributed to the planning and design of the study. E. Ford and K. Deosaransingh performed the data analysis. E. Ford had primary responsibility for drafting the manuscript, and all of the authors reviewed and edited each draft of the manuscript.

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