Disparities by Insurance Status in Quality of Care for Elderly Patients with Unstable Angina

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Context: Treatment disparities for socioeconomically disadvantaged populations have been widely reported, but few studies have sought explanations for these disparities.

Objective: To compare the quality of care for patients insured by Medicare alone, Medicare plus Medicaid, or Medicare plus private insurance and investigate mediators for potential disparities.

Design, Setting, and Participants: Retrospective, random chart review of 3122 African American or White Medicare patients >65 years of age hospitalized for unstable angina in 22 Alabama hospitals, 1993–1999.

Main Outcome Measures: Echocardiogram within 20 minutes of presentation; evaluation by a cardiologist; appropriate anti-platelet therapy within 24 hours of admission and at discharge, heparin for high-risk patients, beta-blockers during hospitalization, and performance of appropriate coronary angiography.

Results: 182 (5.8%) had Medicare only, 433 (13.9%) had Medicare plus Medicaid, and 2507 (80.3%) had Medicare plus private insurance. Medicaid patients were more frequently Black, female, >85 years old, had multiple co-morbidities, or were admitted to hospitals without cardiac catheterization facilities ($P<.001$). Fewer Medicaid patients were admitted to hospitals with cardiac catheterization capabilities. Even after adjustment for demographics and hospital characteristics, Medicaid patients were less likely to see a cardiologist (odds ratio [OR] .57, 95% confidence interval [CI] .44–.73), receive anti-platelet therapy within 24 hours of admission (OR .66, 95% CI .50–.87), or heparin (OR .71, 95% CI .53–.97). No differences were seen with regard to having an electrocardiogram within 20 minutes of admission. Beta-blockers were used least in the Medicare-only patients, with only 37.7% receiving them ($P=.04$). Suitable Medicaid patients received coronary angiography less often, even after adjustment for demographics, co-morbidity, and prior revascularization (OR .68, 95% CI .48–.97). However, when adjusted for hospital characteristics, this finding was no longer observed (OR .94, 95% CI .64–1.39).

Conclusions: Elderly Medicaid patients appear to receive poorer quality of care. This finding is partially, but not completely, explained by characteristics of the facilities where they are hospitalized. (*Ethn Dis*. 2006;16:799–807)

Key Words: Health Insurance, Medicare, Elderly, Angina

Introduction

Disparities exist in the treatment of patients with acute coronary syndrome related to socioeconomic status, race, sex, and type of insurance coverage. Unfortunately, on the basis of these non-medical factors, individuals who might derive clinical benefit from pharmacologic or invasive cardiovascular interventions may not receive them. For example, the use of thrombolytic reperfusion therapy, aspirin, and beta-blockers, all relatively inexpensive interventions that lower mortality when used appropriately, is less in Blacks, women, and those of lower socioeconomic status.[1] Significantly lower rates of cardiac catheterization in patients insured with Medicaid after unstable angina or acute myocardial infarction (MI) have been clearly and consistently documented.[2–5]

These issues may be of particular concern in the elderly Medicare population, who are at increased risk of adverse events because of their advanced age and associated co-morbid conditions.[6–8] In one study, elderly patients with non-Q wave MI and unstable angina were less likely to receive aggressive anti-ischemic therapy, including aspirin, beta-blockers, and heparin, or revascularization procedures, despite more severe and extensive coronary artery disease, which translated into a higher incidence of adverse cardiac events, both in the hospital and at six weeks after discharge.[8] Data from the Gusto II-b trial showed the odds of "ideal" patients with non-ST elevation acute coronary syndromes receiving aspirin at discharge were 15% and 24% lower for patients ages 65–75 and >75 years, respectively, compared with those less than age 65.[9] A study of >45,000 Medicare patients over the age of 65 with acute MI found that only 50% of patients without a contraindication to beta-blockers received the drugs at the time of hospital discharge.[10]

Although Medicare confers medical benefits to almost all Americans over the age of 65, not all services are covered, and this population is socioeconomically heterogeneous. Indigent persons over the age of 65 who can demonstrate economic hardship and require nursing home care or other medical services may qualify for additional coverage with Medicaid, while some elderly individuals, who are financially advantaged, may have supplemental private insurance. Therefore, even in this elderly population, insurance coverage may be a surrogate marker of socioeconomic status, with a gradation from lowest to highest defined as those insured with Medicare plus Medicaid, those with Medicare alone, and those with Medicare plus private supplemental insurance.

To our knowledge, no study has examined the influence of variations in

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insurance coverage on treatment received for unstable angina in the Medicare population over age 65. The purpose of our study was to evaluate the relationship between these categorizations of insurance status with several evidence-based quality-of-care measures of unstable angina, including access to a cardiologist and performance of coronary angiography, as well as hospital characteristics. Our hypothesis was that differences would exist across the groups, with poorer quality in the Medicare plus Medicaid group. In case this hypothesis proved consistent with the data, we sought mediating factors that might explain such disparities.

METHODS

Study Population

The medical records of 4229 Medicare patients enrolled in the Alabama Unstable Angina Study with a confirmed diagnosis of unstable angina were examined.[11–13] These patients were hospitalized at 22 centers throughout the state of Alabama between 1993 and 1999. Patients receiving treatment at hospitals participating in this study were identified from Medicare Part A Standard Analytic (MEDPAR) Files. A random sampling method was developed based on the following International Classification of Diseases – 9th Revision (ICD-9) codes: unstable angina (411.11), angina pectoris (413.9), coronary artery disease (414.01), and chest pain unspecified (786.50). Patients who met any of the following criteria were excluded from the study: 1) a diagnosis of unstable angina was not confirmed by chart review; 2) an MI was documented on initial presentation; 3) the patient was not admitted to the hospital; 4) the patient was discharged the same day as admitted; 5) the patient was transferred from another acute care facility; 6) the patient was admitted from another emergency department; or 7) the patient was admitted for a scheduled cardiac procedure.

Confirmation of Unstable Angina

Confirmation of unstable angina required that the patients' presenting signs and symptoms be consistent with an acute coronary syndrome. The definition of unstable angina used in this study is similar to that reported in other studies of unstable angina such as the Thrombolysis in Myocardial Ischemia (TIMI) III Registry.[8] The admitting physician must have documented that no evidence was seen of acute MI by history, electrocardiogram (ECG) (eg, ST elevation in two contiguous ECG leads), or laboratory criteria (eg, elevated creatinine phosphokinase) at the time of initial presentation. Elements of the patient's history sufficient to indicate unstable angina included: 1) description of symptoms of classical chest pain for $\geq$20 minutes; 2) symptoms new in onset; 3) symptoms occurring at rest or on exertion; 4) symptoms relieved with nitroglycerin; or 5) symptoms nocturnal or crescendo in nature. In addition, documentation by the admitting physician of a probable or definite clinical impression of unstable angina was considered adequate for diagnostic confirmation.

Outcome Measures

We selected six evidence-based quality measures that were modeled on the recommendations outlined in the Agency for Health Care, Policy and Research (AHCPR) unstable angina national practice guidelines.[14] In addition, we determined whether the patient was evaluated by a cardiologist. Each quality measure consisted of a fraction; the denominator expressed the number of patients eligible for a certain therapy, and the numerator expressed eligible patients who received the therapy. Specific eligibility criteria for five of the evidenced-based measures were developed by study group members and a panel of 10 experts external to the original study. For each measure, eligibility criteria were as follows:

1. *Performance of 12-lead electrocardiogram (ECG) within 20 minutes of arrival.* All patients who were at moderate-to-high risk for acute MI or death during hospitalization according to the AHCPR unstable angina guidelines and admitted through the emergency department were eligible for an ECG within 20 minutes of arrival.
2. *Administration of anti-platelet therapy (aspirin, ticlopidine, or clopidogrel) within 24 hours of admission.* Patients were excluded from the denominator of the measure if they were allergic to aspirin, ticlopidine, or clopidogrel or had documentation of increased bleeding risk (peptic ulcer, gastritis, history of ulcer disease, internal bleeding, platelet count $<100 \times 10^9$/L, bleeding disorder, creatinine >3 mg/dL, or currently taking warfarin).
3. *Administration of anti-platelet therapy at discharge.* See exclusion criteria above. Also, patients were excluded from assessment of antiplatelet therapy at discharge if they died in the hospital or were transferred to another facility.
4. *Administration of heparin during hospitalization for high-risk patients.* All moderate- to high-risk patients were considered eligible to receive heparin during hospitalization ac-

cording to the AHCPR guidelines, unless they had a documented contraindication such as increased bleeding risk (see anti-platelet therapy above) or an allergy to heparin.

5. *Administration of a beta-blocker during hospitalization.* Patients were excluded from being in the denominator of the beta-blocker measure if they demonstrated potential hemodynamic instability, such as cardiovascular shock, systolic blood pressure <100 mm Hg, pulse rate <50 beats per minute while not on a beta-blocker, or second- or third-degree heart block. Patients with the following conditions were also excluded from the denominator: asthma, chronic obstructive pulmonary disease, depression (or taking antidepressant medication), Raynaud disease or phenomenon, congestive heart failure, or pulmonary edema.
6. *Performance of coronary angiography.* Patients were classified as ideal candidates for coronary angiography if they had class I indications according to American College of Cardiology/American Heart Association (ACC/AHA) criteria.[15] The criteria included one or both of the following: an episode of myocardial ischemia (manifested as prolonged chest pain or a positive stress test) or persistent cardiovascular compromise (manifested as cardiogenic shock on arrival at the hospital or during the hospital stay, hypotension while hospitalized, congestive heart failure, pulmonary edema with an ejection fraction ≤40%, or a combination of these findings). Exclusion criteria included those patients with absolute and relative contraindications as delineated in the ACC/AHA guidelines and those patients for whom a physician with reasonable clinical judgment might view the intervention as questionable.

Chart Abstraction

Charts were abstracted by the DynKePRO Clinical Data Abstraction Center.[16] A standardized chart review protocol was developed and refined through pilot testing. Chart abstractors underwent extensive training, and quality was monitored by dual abstraction of a 5% random sample of all charts. Inter-rater reliability, which was >95% on all quality measure variables, was based on the agreement rate of the two abstractors. Validity, which was also >95% on all quality measure variables, was derived by comparing the abstractors' results with a gold standard developed by a panel of clinicians.

Patients Excluded from Analysis

Of the 4229 unstable angina patients, we excluded 89 whose race was not classified as Caucasian or African American and 659 who were <65 years of age. Also excluded were 349 patients with serious non-cardiac illnesses (ie, HIV/AIDS or other immunosuppressed condition, lymphoma, leukemia, metastatic cancer, cirrhosis, hepatic failure, terminal illness, or dementia) who, at the time of treatment, might have warranted less aggressive management of unstable angina and 10 patients for whom information on insurance was missing. A total of 3122 patients remained for analysis.

Data Analysis

Patients were categorized into three groups for statistical analysis: 1) those with Medicare and Medicaid coverage; 2) those with Medicare coverage only; and 3) those with Medicare plus private supplemental insurance. Chi-square tests and analysis of variance were used to ascertain significance of differences between the three insurance coverage groups in the following categories (see Tables 1–3): 1) patient demographics, 2) co-morbidities present at time of admission, 3) clinical presentation, 4) characteristics of the treating hospital, 5) evaluation by a cardiologist, 6) and the process-of-care measures described above. Logistic regression analyses were performed to estimate odds ratios (OR) and 95% confidence intervals (CI) for the selected characteristics with whether or not a person was covered by Medicaid. Separate models were run for each process-of-care measure, for which the dependent variable was receipt of the specified process measure and the independent variable of primary interest was coverage by Medicaid. Three groups of models were assessed: 1) unadjusted; 2) adjusted for age, race, and sex; and 3) adjusted for the hospital characteristics of number of beds, hospital teaching status (defined as having full-time house staff), location in a major metropolitan area, and presence of cardiac catheterization facilities. In addition, associations regarding angiography were adjusted for prior conditions, procedures, and presenting clinical characteristics. Stepwise regression techniques were used to identify additional characteristics predictive of angiography. The logistic regression analysis was repeated excluding patients not covered by any Medicare supplemental insurance. This exclusion had no effect on the findings and is not presented.

RESULTS

The average age (± standard deviation) was 75.6 ± 7.1 years (range 65–106 years) in the 3122 individuals analyzed, of whom 59.5% were female and 9.8% were African American. Overall, 5.8% (n=182) had Medicare only, 13.9% (n=433) had Medicare plus Medicaid, and 80.3% (n=2,507) had Medicare plus private supplemental insurance. Demographic and co-morbidity data, based on insurance category, are presented in Table 1. Compared to the other two groups, a higher proportion of patients with private supplemental insurance were White, while a higher proportion of Medicaid pa-

Table 1. Demographics and co-morbidities in unstable angina cases according to insurance carried among elderly Medicare beneficiaries, Alabama, 1993–1999

	Insurance Category						
	Medicare and Medicaid *N*=433		Medicare Only *N*=182		Medicare and Private *N*=2507		
	n	%	*n*	%	*n*	%	*P*
Demographics							
Female	347	80.1	100	55.0	1410	56.2	<.001
Black	91	21.0	40	22.0	177	7.1	<.001
Age (years)							
65–74	191	44.1	106	58.2	1147	45.8	
75–84	156	36.0	63	34.6	1097	43.8	
≥85	86	19.9	13	7.1	263	10.5	<.001
History of co-morbid conditions and procedures							
Diabetes	142	32.8	53	29.1	671	26.8	.03
Hypertension	335	77.4	140	76.9	1747	69.7	.001
Coronary heart disease	311	71.8	110	60.4	1686	67.3	.02
Cerebral vascular accident	93	21.5	28	15.4	373	14.9	.002
Myocardial infarction	148	34.2	64	35.2	941	37.5	.4
Congestive heart failure	40	9.2	19	10.4	185	7.4	.2
Peripheral vascular disease	50	11.6	12	6.6	290	11.6	.1
COPD/asthma	126	29.1	38	28.9	546	21.8	.003
Renal failure	43	9.9	14	7.7	145	5.8	.004
PTCA	60	13.9	29	15.9	554	22.1	<.001
CABG	82	18.9	39	21.4	643	25.7	.007
Smoking	69	15.9	46	25.3	704	28.1	<.001
Family history of CHD	169	39.0	82	45.1	1015	40.5	.4
Mean number of above conditions	3.0		2.6		2.6		<.001

COPD=chronic obstructive pulmonary disease; PTCA=percutaneous transluminal coronary angioplasty; CABG=coronary artery bypass grafting; CHD=coronary heart disease.

tients were female, were aged ≥85 years, and had more co-morbid conditions. Fewer Medicaid patients were smokers. The proportion of patients who had previously undergone a revascularization procedure was lowest among Medicaid patients and highest among patients with private supplemental insurance.

A higher proportion of patients with Medicaid had chest pain >24 hours in duration than did non-Medicaid patients (Table 2). Patients with Medicare plus a private supplement had significantly lower mean systolic and diastolic blood pressures and lower mean heart rate with less rales on physical examination at time of initial presentation. This group was more likely to be treated in a major urban or teaching hospital. Fewer Medicaid patients were admitted to hospitals with cardiac catheterization capabilities. Medicaid patients were less likely to receive care by a cardiologist, either as a primary physician or as a consultant, compared to the other two groups. This difference persisted after adjustment for age, race, sex and hospital characteristics (OR .57, 95% CI .44–.73). Medicaid patients were less likely to have a cardiologist as the primary attending physician in crude analysis and when adjusted for age, race, and sex; however, when adjusted for hospital characteristics, no difference was found. Among patients whose attending physician was not a cardiologist, Medicaid patients were less likely to have had a consultation with a cardiologist, an association which remained significant after adjusting for hospital characteristics (OR .52, 95% CI .40–.69).

Generally, utilization of medical therapies was low (Table 3). Even in the Medicare plus private insurance group, which had the highest utilization of medical therapies, only 50% received beta blockers, 67% received aspirin within 24 hours, 69% received aspirin at discharge, and ≈40% received heparin. Echocardiography and multiple gated angiography were performed equally in all groups. Patients with Medicaid were significantly less likely to receive aspirin within 24 hours of presentation (OR .60, 95% CI .46–.79), aspirin at discharge (OR .57, 95% CI .43–.76), and heparin while hospitalized (OR .61, 95% CI .46–.81) compared to the non-Medicaid groups (Table 3 and Figure 1). These differences remained significant when adjusted for age, race, and sex and after adjustment for hospital characteristics, except for aspirin at discharge (Figure 1). No differences were seen between groups with regard to having an ECG within 20 minutes of admission. Beta-blockers were used least in Medicare-only patients; only 37.7% received them (P=.04). Medicaid patients, analyzed as a total group and a subgroup of ideal candidates, were less likely to undergo coronary angiography than non-Medicaid patients (Tables 3 and 4 and Figure 2). Among the ideal candidates (N=477), after adjustment for age, race, sex, co-morbidity, prior percutaneous revascularization procedure, and blood pressure, Medicaid patients were less likely to undergo coronary angiography (OR .68, 95% CI .48–.97) compared with the non-Medicaid patients; however, when adjusted for hospital characteristics, no difference was seen between the two groups (OR .94, 95% CI .64–1.39). This finding reflects the higher proportion of Medicaid patients vs non-Medicaid patients treated at hospitals without cardiac catheterization facilities, 57% vs 43% (P<.001). A smaller proportion of Medicaid patients admitted to hospitals without cardiac catheterization facilities underwent coronary angiography (via transfer to a capable

Table 2. Presentation and characteristics of treating hospitals among elderly Medicare beneficiaries with unstable angina patients according to supplemental insurance carried, Alabama, 1993–1999

	Insurance Category						
	Medicare and Medicaid		Medicare Only		Medicare and Private		
	n	%	*n*	%	*n*	%	*P*
Presentation							
Mean systolic blood pressure (mm Hg)	157		158		154		.05
Mean diastolic blood pressure (mm Hg)	82		84		80		.004
Mean heart rate	84		86		81		<.001
Chest pain on arrival	306	72.7	133	74.3	1750	71.9	.8
Chest pain >24 hours after arrival	139	32.1	46	25.3	647	25.8	.02
Rales	121	28.4	57	31.8	544	22.2	<.001
S3 or gallop rhythm	16	3.7	9	5.0	90	3.6	.6
Hospital characteristics							
Teaching	139	32.1	59	32.2	1146	45.7	<.001
Major urban	58	13.4	54	29.7	834	33.3	<.001
Cardiac catheterization facilities	185	42.7	114	62.6	1416	56.6	<.001
Number of beds							
<200	197	45.5	54	29.7	807	32.2	
200–399	194	44.8	93	51.1	1043	41.6	
≥400	42	9.7	35	19.2	657	26.2	<.001
Cardiologist care							
Any cardiologist care	230	56.0	138	78.0	1739	71.2	<.001
As primary physician	57	14.8	39	22.7	550	23.9	<.001
As consultation*	147	44.8	94	70.7	1052	60.0	<.001

* Among patients whose primary physician was not a cardiologist.

facility) than did Medicaid patients admitted to hospitals with these facilities, 16.9% vs 30.8%, $P<.001$ (Table 4). Among ideal candidates for angiography admitted to hospitals without cardiac catheterization facilities, the proportion of Medicaid patients who underwent angiography was slightly smaller than the proportion of non-Medicaid patients (16% vs 22%, $P=.16$). In contrast, among ideal candidates who were admitted to hospitals with cardiac catheterization facilities, a significantly smaller proportion of Medicaid patients than non-Medicaid patients underwent angiography (28% vs 42%, $P=.006$). After adjustment for demographic, clinical, and hospital characteristics, the ORs for Medicaid patients undergoing cardiac catheterization were not statistically significantly different from 1, overall or within strata defined by the hospital having cardiac catheterization capabilities.

DISCUSSION

The principal findings of this study of elderly Medicare patients hospitalized with unstable angina were as follows: 1) Medicare patients with Medicaid tended to be older, female, and Black with more co-morbid conditions; 2) those with Medicare and Medicaid or Medicare alone had markers of more severe illness, including prolonged chest pain and rales, as compared to the Medicare plus private insurance group; 3) despite a greater severity of illness, those with Medicaid were less likely to receive any care from a cardiologist, receive standard medical therapy in the form of aspirin and heparin, or undergo cardiac catheterization; 4) after adjustment for the characteristics of the admitting hospital, disparities in cardiac catheterization, but not in the other quality measures, were no longer significant.

The results of our study are consistent with those of other studies that have demonstrated disparities in delivery of care, particularly invasive procedures, in the setting of acute coronary syndrome based on insurance status. For example, an analysis of the National Registry of Myocardial Infarction 2 (NMRI 2) found that acute reperfusion therapies and invasive cardiac procedures were used least in Medicaid recipients, with higher rates of short-term death in this group compared to groups insured by Medicare, health management organizations, or private payers.[3] The NMRI 2 study findings parallel those of Sada et al, who demonstrated that Medicaid patients are less likely to undergo coronary angiography or coronary revascularization after MI compared to those with fee-for-service coverage; however, this analysis excluded those over the age of 65.[4] Philbin et al found insurance with Medicaid to be an independent negative predictor of procedure use even after adjustment for relevant demographic and clinical factors and hospital characteristics.[5] Another study demonstrated that those in the lowest quintile of income, based on median household income for the patient's zip code, were less likely than those in the highest quintile to undergo catheterization, percutaneous revascularization, and coronary artery bypass grafting after acute MI. The lowest socioeconomic quintile was insured more often with Medicaid and was more often Black and female, with a greater number of coexisting illnesses, a demographic profile similar to the Medicaid group in our study.[17]

We found that Medicaid patients were admitted less often to hospitals with on-site cardiac catheterization facilities. The availability of on-site catheterization facilities has been shown to influence the likelihood of receiving this procedure.[18–20] Therefore, being admitted to a hospital without catheterization facilities will decrease the likelihood of coronary angiography at baseline. How-

Table 3. Distribution of therapies and procedures received according to supplemental insurance among elderly Medicare beneficiaries with unstable angina, Alabama, 1993–1999

Characteristics	Insurance Category: Medicare and Medicaid *n*	%	Medicare Only *n*	%	Medicare and Private *n*	%	*P*
Quality-of-care indicators							
ECG within 20 min	159	47.9	70	48.6	980	53.4	.1
APT within 24 hours	144	55.4	88	70.4	999	67.0	<.001
APT at discharge	129	55.8	63	66.3	855	69.1	<.001
Heparin	75	28.6	47	38.2	594	39.8	.003
Beta-blockers	67	43.8	29	37.7	544	50.3	.04
Procedures in hospital							
ECG	140	32.3	64	35.2	732	29.2	.1
MUGA	21	4.8	15	8.2	131	5.2	.2
Coronary angiography							
Everyone	99	22.9	68	37.4	914	36.5	<.001
Ideal candidates*	51	21.2	31	34.1	395	33.2	<.001

* Persons who had an episode of myocardial ischemia (manifested as prolonged chest pain or a positive stress test) or persistent hemodynamic instability (manifested as cardiogenic shock on arrival at the hospital or during the hospital stay, hypotension while hospitalized, congestive heart failure, or pulmonary edema with an ejection fraction ≤40%, or a combination of these findings).

ECG=electrocardiogram; APT=anti-platelet therapy; MUGA=multi-gated acquisition.

ever, not only is baseline likelihood decreased, those with Medicaid may be further disadvantaged because they are less likely to be subsequently transferred to a facility with these capabilities. For example, Gurwitz et al found that acute MI patients insured with Medicaid or Medicare were less likely to be transferred to another institution with a greater degree of diagnostic and therapeutic cardiovascular procedures, compared with commercially insured individuals. Older age, non-White race, and female sex were also independently associated with lower likelihood of transfer, again a profile similar to that of the Medicaid-insured patients in our study.[21]

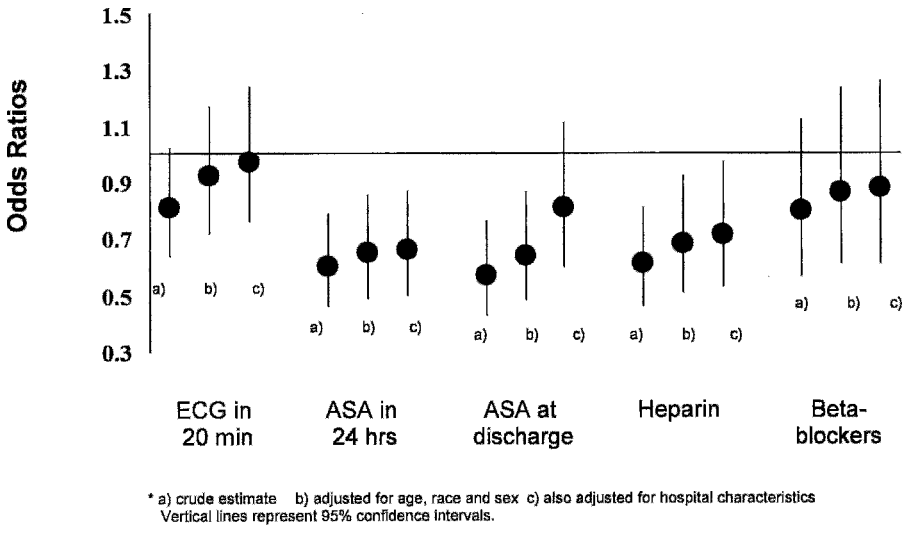

Fig 1. Processes of care odds ratios* associated with Medicaid coverage vs no Medicaid coverage

Part of the inequity in access to invasive cardiac diagnostic procedures for the Medicaid patients may have been related to the lack of availability of consultation by a cardiologist. Cardiologists may be more aware of the appropriate uses of life-saving therapies in the treatment of unstable angina and acute MI, resulting in improved outcomes and lower mortality.[22–25] However, this difference would not fully account for differences in medical care, in the form of pharmacologic therapy, observed in our study. For example, administration of aspirin is recommended in the emergency department as soon as the diagnosis of acute coronary syndrome is suspected, even before evaluation by an internist or cardiologist.[26] Heparin is easily administered to individuals without contraindications and should not require the prompting of a cardiologist. The Medicaid patients we studied received both of these proven therapies less often.

One possible explanation for the observed differences may be patient preferences; Medicaid patients may refuse invasive evaluation or certain medical therapies. Although this possibility cannot be fully refuted, it seems unlikely, particularly for noninvasive treatment such as the administration of aspirin. Overall, utilization rates of medical therapy were poor in all three groups. This finding is consistent with the observations of others that in general, guideline-recommended standards are poorly met in the treatment of unstable angina in the Medicare population. For example, Simpson et al, in a survey of 16 hospitals in North Carolina, found that in ideal patients, aspirin use was 76%, heparin use was 63%, and beta-blocker use was 44.5% during hospitalization; aspirin use at discharge was 67%.[27] In a sampling of Connecticut hospitals, Krumholz found that 72% of Medicare patients with no

Table 4. Odds ratios for Medicaid patients (vs non-Medicaid patients) receiving coronary angiography in facilities with cardiac catheterization laboratory (cath lab), no cath lab, and for all patients (upper rows) and for ideal candidates (lower rows)

	All Patients (*N*=1081)						
	Receiving Angiography (%)			Odds Ratio – adjusted for*			
	Medicaid –Yes	Medicaid –No	*P*	Crude	Demo-graphics	Demo and Clin	Demo, Clin, and Hospital
Cath lab hospitals	30.8	46.8	<.001	**.51**	**.62**	**.66**	.76
No cath lab	16.9	23.0	.04	**.68**	.82	.89	1.08
ALL	22.9	36.5	<.001	**.52**	**.61**	**.66**	.91
	Ideal Candidates (*n*=477)						
	Receiving Angiography (%)			Odds Ratio – adjusted for*			
	Medicaid –Yes	Medicaid-No	*P*	Crude	Demo-graphics	Demo and Clin	Demo, Clin, and Hospital
Cath lab hospitals	27.7	42.0	.006	**.53**	.62	.67	.78
No cath lab	16.4	21.8	.16	.70	.83	.88	1.12
ALL	21.2	33.2	<.001	**.54**	**.63**	**.68**	.94

* Demographics: age, race, sex; Clin: number of co-morbid conditions, history of percutaneous coronary intervention, systolic blood pressure <120 mm Hg; hospital: teaching, urban, size, catheterization laboratory.
Demo=demographics; clin=clinical.

contraindications to aspirin received it, and only 24% received heparin.[28]

LIMITATIONS

Data collected were from the state of Alabama and may not be generalizable to other states and regions. In addition, our 22 hospitals are only a subset of Alabama's 106 acute care facilities. Nonetheless, these hospitals represent a mix of rural vs urban, teaching vs non-teaching, and small vs large facilities. Within each hospital, patients were randomly selected within each stratum of all eligible patients. However, our results are consistent with those of other studies published on the quality of care in acute coronary syndromes. Therefore, although selection bias may have occurred, it is unlikely to have affected the fundamental finding of an association between Medicaid insurance status and worse quality of care.

Another potential limitation is that insurance was used as a surrogate of socioeconomic status because specific socioecomonic data were not available. Nonetheless, Medicaid coverage is a marker for low income because of eligibility criteria for Medicaid, which are particularly stringent in Alabama and thus identify a very low-income population.

We could not collect data on patient preferences as a potential mediator of these disparities, although preferences are unlikely to explain differences in anti-platelet therapy. Like the AHCPR guidelines, our criteria for eligibility for several therapies deliberately erred on the side of leniency, ie, patients were considered ineligible if they had only a relative contraindication, to ensure that patients in the denominator for each measure should have received the therapy. For example, excluding patients with depression from the denominator for the beta-blocker quality measure ensures that the patients left in the denominator had no contraindications to beta-blockers, not even relative contraindications.

Any study of unstable angina that is based on medical record review faces complex issues of diagnosis validation. The primary purpose of our study was to assess quality of care for hospitalized

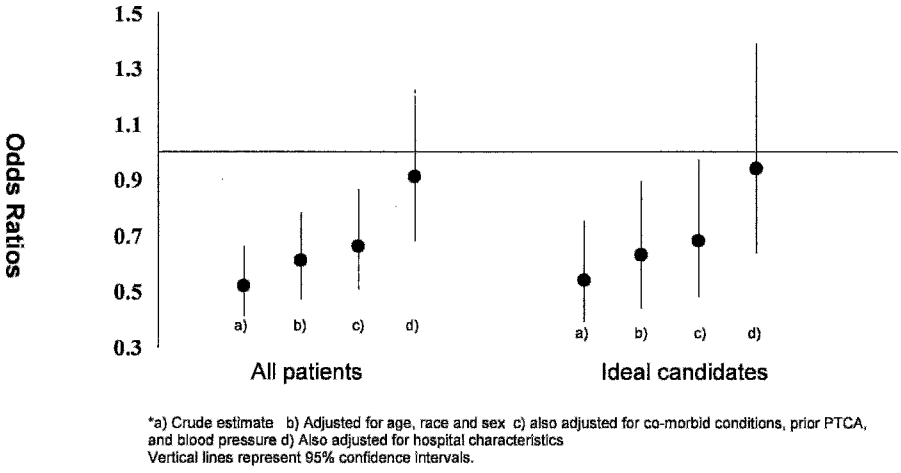

Fig 2. Odds ratios* of coronary angiography associated with Medicaid coverage

Our study demonstrates disparities in healthcare delivery to Medicare patients over the age of 65, with Medicaid patients, those in the lowest income stratum, receiving the poorest care.

patients with unstable angina. Because of this, we used the criteria that AHRQ uses in its published guidelines and also considered the diagnosis as validated when the admitting physician used unstable angina as admission diagnosis. The rationale for this was that if the physician was using unstable angina as the operative diagnosis, then evidence-based therapy should have followed the AHCPR guidelines, as reflected in our quality measures.

CONCLUSIONS

Our study demonstrates disparities in healthcare delivery to Medicare patients over the age of 65, with Medicaid patients, those in the lowest income stratum, receiving the poorest care. To our knowledge, this is the first study that has stratified a Medicare population in this way, with differences in quality of care observed based on insurance status, even after adjustments for differences in age, sex, race, and detailed clinical characteristics. Part, but not all, of these differences were mediated by the fact that Medicaid patients were preferentially admitted to smaller hospitals with less technological capability. These, we believe, are new findings.

Theoretically, Medicaid supplemental insurance should assist lower income individuals with accessing needed health services and paying for medications; however, these individuals appear to be at a disadvantage, and decreased access to higher technology hospitals is one explanation. Health outcomes are a complex interaction of biomedical, socioeconomic, demographic, and psychosocial factors.[29] Biases within the healthcare system itself may also contribute, as suggested by residual differences even after adjustments for demographic, clinical, and hospital characteristics. Further study is needed to elucidate the factors that are negatively influencing the access of these individuals to quality health care.

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REFERENCES

1. Rathore SS, Berger AK, Weinfurt KP, et al. Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation.* 2000;102:642–648.
2. Cho L, Bhatt DL, Brennan D, Wilcox RG, Topol EJ. Relation of insurance status to performance of coronary angiography in patients with unstable angina pectoris or acute myocardial infarction. *Am J Cardiol.* 2003; 91:721–723.
3. Canto JG, Rogers WJ, French WJ, Gore JM, Chandra NC, Barron HV. Payer status and the utilization of hospital resources in acute myocardial infarction: a report from the National Registry of Myocardial Infarction 2. *Arch Intern Med.* 2000;160:817–823.
4. Sada MJ, French WJ, Carlisle DM, Chandra NC, Gore JM, Rogers WJ. Influence of payor on use of invasive cardiac procedures and patient outcome after myocardial infarction in the United States. *J Am Coll Cardiol.* 1998; 31:1474–1480.
5. Philbin EF, McCullough PA, DiSalvo TG, Dec WG, Jenkins PL, Weaver DW. Underuse of invasive procedures among Medicaid patients with acute myocardial infarction. *Am J Public Health.* 2001;91:1082–1088.
6. Tofler GH, Muller JE, Stone PH, et al. and the MILIS Study Group. Factors leading to shorter survival after acute myocardial infarction in patients ages 65 to 75 compared with younger patients. *Am J Cardiol.* 1998; 62:860–867.
7. Smith SC, Gilpin E, Ahnve S, et al. Outlook for acute myocardial infarction in the very elderly compared with that in patients 65–75 years. *J Am Coll Cardiol.* 1990;16: 784–792.
8. Stone PH, Thompson B, Anderson VH, et al. Influence of race, sex and age on management of unstable angina and non-Q wave myocardial infarction. *JAMA.* 1996;275:1104–1112.
9. Alexander KP, Peterson ED, Granger CB, et al. Potential impact of evidence-based medicine in acute coronary syndromes: insights from GUSTO-IIb. *J Am Coll Cardiol.* 1998; 32:2023–2030.
10. Krumholz HM, Radfor MJ, Wang Y, Chen J, Heiat A, Marciniak TA. National use and effectiveness of ß-blockers for the treatment of elderly patients after acute myocardial infarction. *JAMA.* 1998;280:623–629.
11. Canto JG, Fincher C, Kiefe CI, et al. Atypical presentations among Medicare beneficiaries with unstable angina pectoris. *Am J Cardiol.* 2002;90(3):248–253.
12. Berner ES, Baker CS, Funkhouser E, et al. Do local opinion leaders augment hospital quality improvement efforts? A randomized trial to promote adherence to unstable angina guidelines. *Med Care.* 2003;41(3):420–431.
13. Centor RM, Allison JJ, Weissman NW, et al. Diffusion of troponin testing in unstable angina patients: adoption prior to guideline release. *J Clin Epidemiol.* 2003;56(12): 1236–1243.

14. Braunwald E, Mark DB, Jones RH, et al. *Unstable Angina: Diagnosis and Management*. Rockville, Md: Agency for Health Care Policy and Research and the National Heart, Lung and Blood Institute, Public Health Service, US Dept of Health and Human Services; 1994:1–154. AHCPR Publication No. 94-0602.
15. Braunwald E, Antman EM, Beasley JW, et al. ACC/AHA guidelines for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Patients with Unstable Angina). *J Am Coll Cardiol*. 2000;36:970–1062.
16. Alison JJ, Wall T, Spettell C, et al. The art and science of chart review. *Jt Comm J Qual Improve*. 2000;26(3):115–136.
17. Philbin EF, McCullough PA, DiSalvo TG, Dec WG, Jenkins PL, Weaver WD. Socioeconomic status is an important determinant of the use of invasive procedures after acute myocardial infarction in New York state. *Circulation*. 2000;102(suppl III):III-107–III-115.
18. Every NR, Larson EB, Litwin PE, et al. The association between on-site cardiac catheterization facilities and the use of coronary angiography after acute myocardial infarction. *N Engl J Med*. 1993;329:546–551.
19. Blustein J. High-technology cardiac procedures: the impact of service availability on service use in New York state. *JAMA*. 1993; 270:344–349.
20. Canto JG, Rogers WJ, Zhang Y, et al, for the National Registry of Myocardial Infarction 2 Investigators. The association between the on-site availability of cardiac procedures and the utilization of those services for acute myocardial infarction by payer group. *Clin Cardiol*. 1999;22:519–524.
21. Gurwitz JH, Goldberg RJ, Malmgren A, et al. Hospital transfer of patients with acute myocardial infarction: the effects of age, race, and insurance type. *Am J Med*. 2002; 112:528–534.
22. Ayanian JZ, Hauptman PJ, Guadagnoli E, Antman EM, Pashos CL, McNeil BJ. Knowledge and practices of generalist and specialist physicians regarding drug therapy for acute myocardial infarction. *N Engl J Med*. 1994; 331:1136–1142.
23. Schreiber TL, Eikharib A, Grines CL, O'Neill WW. Cardiologist versus internist management of patients with unstable angina: treatment patterns and outcomes. *J Am Coll Cardiol*. 1995;26:577–582.
24. Jollis JG, DeLong ER, Peterson ED, et al. Outcome of acute myocardial infarction according to specialty of the admitting physician. *N Engl J Med*. 1996;335: 1880–1887.
25. Casale PN, Jones JL, Wolf FE, Pei Y, Eby LM. Patients treated by cardiologists have lower in-hospital mortality for acute myocardial infarction. *J Am Coll Cardiol*. 1998;32:885–889.
26. Braunwald E, Antman EM, Beasley JW, et al. ACC/AHA 2002 guideline update for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Patients with Unstable Angina). *Circulation*. 2002;106:1893–1900.
27. Simpson RJ, Weiser RR, Naylor S, Sueta CA, Metts AK. Improving care for unstable angina patients in a multiple hospital project sponsored by a federally designated quality improvement organization. *Am J Cardiol*. 1997;80(8B):80H–84H.
28. Krumholz HM, Philbin DM, Wang Y, et al. Trends in the quality of care for Medicare beneficiaries admitted to the hospital with unstable angina. *J Am Coll Cardiol*. 1998; 31:957–963.
29. Williams DR. Socioeconomic differential in health: a review and redirection. *Soc Psychol Q*. 1990;53:81–99.

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