

Differences in Physician Compensation for Cardiovascular Services by Age, Sex, and Race

Harlan M. Krumholz, MD; A. Mark Fendrick, MD; Christianna Williams, MA; and William M. Hynes

Abstract

The purpose was to determine whether physicians receive substantially less compensation from patient groups (women, older patients, and nonwhite patients) that are reported to have low rates of utilization of cardiovascular services. Over an 18-month period we collected information on payments to physicians by 3,194 consecutive patients who underwent stress testing and 833 consecutive patients who underwent percutaneous coronary angioplasty at the Yale University Cardiology Practice. Although the charges for procedures were not related to patient characteristics, there were large and significant differences in payment to physicians based on age, sex, and race. For example, physicians who performed percutaneous transluminal coronary angioplasty received at least \$2,500 from, or on behalf of, 72% of the patients 40 to 64 years old, 22% of the patients 65 to 74 years old, and 3% of the patients 75 years and older ($P < 0.001$); from 49% of the men and 28% of the women ($P < 0.001$); and 42% of the whites and 31% of the nonwhites ($P < 0.001$). Similar differences were observed for stress testing. These associations were largely explained by differences in insurance status.

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From the Section of Cardiovascular Medicine, Department of Medicine and Department of Epidemiology and Public Health, and the Division of Chronic Disease Epidemiology, Department of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT, and the Center for Outcomes Research and Evaluation, Yale-New Haven Hospital, New Haven, CT (H.M.K.); the Division of General Medicine and Consortium for Health Outcomes, Innovation, and Cost Effectiveness Studies, Department of Internal Medicine, University of Michigan School of Medicine, Ann Arbor, MI (A.M.F.); the Division of Chronic Disease Epidemiology, Department of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT (C.W.); and the Section of Cardiovascular Medicine, Department of Medicine and Department of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT (W.M.H.).

Address correspondence to: Harlan M. Krumholz, MD, Section of Cardiovascular Medicine, Yale School of Medicine, 333 Cedar Street, New Haven, CT 06510.

Physicians currently receive compensation from many sources, including the patient, the federal government, local government, private insurance companies, contracts from health maintenance organizations (HMOs), and self-insured businesses.¹ Heterogeneity in insurance status may result in substantial variation in physician compensation, even among insured patients. If patterns of insurance status are associated with age, sex, and race, then these patient characteristics may also correlate with physician compensation. Physicians may therefore receive more payment from certain patient groups than from others for similar services.

The diversity of insurance status and physician compensation may have important implications for practice patterns. Wenneker and colleagues² reported that privately insured patients in Massachusetts were much more likely than uninsured patients or Medicaid patients to undergo cardiovascular procedures. In their discussion, they allude to the influence of payment by stating that there are "significant disincentives for both hospitals and physicians to care for uninsured and Medicaid patients." Welch and colleagues³ recently published a study examining the variation in Medicare reimbursement for 317 US metropolitan statistical areas. They reported that areas with higher levels of physician compensation for inpatient care had higher rates of hospital admissions. Recently the American College of Cardiology, through a task force on the underserved, stated that "reimbursement must appropriately reward those caring for underserved patients."⁴

We presumed that there could be substantial differences in physician compensation by the demographic characteristics and insurance status of the patient and sought to quantify these differences. Accordingly, we analyzed the financial records of a large academic cardiology practice to determine the variation in total physician compensation by age, sex, and race for two common cardiovascular ser-

VICES: stress test interpretation and the performance of percutaneous transluminal coronary angioplasty. We sought to determine whether total payments to physicians from female patients, older patients, and nonwhite patients (groups with reportedly low utilization rates of cardiovascular services)⁵⁻¹³ were significantly lower than payments from male patients, younger patients, and white patients, respectively. Further-more, we evaluated whether any differences in physician payment by patient age, sex, and race could be explained by differences in insurance coverage.

... METHODS ...

Data Source

The financial records of the Yale University Cardiology Practice were examined for the period from January 1, 1992, to June 30, 1993, and two distinct groups were assembled: (1) 3,194 consecutive patients who underwent cardiovascular electrocardiographic stress testing (current procedural terminology [CPT] code 93018); and (2) 833 consecutive patients who underwent percutaneous transluminal coronary balloon angioplasty (CPT code 92982). All services were performed at Yale-New Haven Hospital in New Haven, Connecticut, a 900-bed university medical center that serves as a community hospital for New Haven county as well as a tertiary care referral center for the northeastern United States. During the study, the charge for the cardiovascular electrocardiographic stress test increased from \$170 to \$230. There was no association between the charge for the service and patient characteristics or insurance status. The charge for percutaneous transluminal coronary balloon angioplasty was \$4,004 for the entire study period.

Variables

The independent variables in this study were age, sex, race, and insurance status. Information on these variables was collected prospectively. The insurer was defined as the party who was responsible for the majority of the payment to the physician. Insurance was coded as private insurance, HMO, Medicare, Medicaid, no insurance. Age was stratified into three groups: 40-64 years; 65-74 years; and ≥ 75 years. Race was classified as white and nonwhite. The outcome variable for this study was total physician compensation. Physician compensation was defined as the total payment from all sources that had been received from, or on behalf of, the patient as of February 15, 1994, thus allowing at

least 7 months after the service for each account to be settled.

Data Analysis

Analyses were performed separately for stress test interpretation and percutaneous transluminal coronary angioplasty. Concerns that total physician compensation was not distributed by visual inspection prompted the use of nonparametric methods. For this statistical analysis, patients were divided into three groups based on total physician compensation: <\$1,000, \$1,000-\$2,499, and >\$2,500 for angioplasty and <\$40, \$40-\$79, and >\$80 for stress test interpretation. These cut points were identified by visual inspection of the frequency distribution of each group. The associations between physician compensation and insurance status, patient characteristics (age, sex, and race) and insurance status, and patient characteristics and physician compensation were all tested in chi-square analyses. The association between patient characteristics and total physician compensation was also compared within each insurance group. In stratified analyses, Fisher's exact test was used when appropriate. *P* values of <0.05 were considered significant. The statistical calculations were performed by using SAS statistical software (SAS Institute, Cary, NC).

... RESULTS ...

Patient Characteristics and Payment

There were substantial and significant differences in payment to physicians by age, sex, and race (Table 1). For the performance of percutaneous transluminal coronary angioplasty, physicians were paid at least \$2,500 by, or on behalf of, 72% of the patients 40 to 64 years old, 22% of the patients 65 to 74 years old, and 3% of the patients 75 years and older (*P* < 0.001). For stress test interpretation, physicians were paid at least \$80 by, or on behalf of, 60% of the patients 40 to 64 years old, 26% of the patients 65 to 74 years old, and 2% of the patients 75 years and older (*P* < 0.001).

The sex of patients was also strongly associated with payment to physicians. Physicians who performed percutaneous transluminal coronary angioplasty were paid at least \$2,500 by, or on behalf of, 49% of the men and only 28% of women (*P* < 0.001). In addition, for stress test interpretation physicians received at least \$80 from 47% of the men and from 28% of the women (*P* < 0.001).

Finally, payment for services was also significantly associated with race. Physicians received at least

\$2,500 for percutaneous transluminal coronary angioplasty from 42% of the white patients and from 31% of the nonwhite patients ($P < 0.001$). Physicians received at least \$80 for stress test interpretation from 45% of the white patients and from 24% of the nonwhite patients ($P < 0.001$).

Patient Characteristics and Insurance Coverage

For stress test interpretation and the performance of percutaneous transluminal coronary angioplasty, there were highly significant associations ($P < 0.001$) between patient characteristics and type of insurance coverage (Table 2). Older patients were most likely covered by Medicare, although 15% of the stress test patients who were 65 years and older were privately insured. Women were less likely than men to have private insurance and more likely to have Medicare or to be covered by a state agency. Nonwhites were more likely than whites to be uninsured or to be covered by a government agency.

Insurance Coverage and Payment by Intervention

There were 3,194 patients who had a stress test interpretation and 833 patients who had percutaneous transluminal coronary angioplasty. A majority of patients were covered by either Medicare (39% of the stress test interpretation group and 46% of the angioplasty group) or a private insurance company (34% of the stress test interpretation group and 39% of the angioplasty group). A minority of the patients were covered by an HMO, Medicaid, or were self-pay.

Although there was no association between the charge to the patient and the insurance coverage, there were large and significant variations in total payments to physicians based on insurance coverage for percutaneous transluminal coronary angioplasty ($P < 0.001$) and stress test interpretation ($P < 0.001$) (Table 3). Whereas physicians who performed percutaneous transluminal coronary angioplasty received \$2,500 or more from 95% of the patients who were covered by private insurance and 64% of the patients belonging to an HMO, physicians received that much compensation from 1% of the patients covered by Medicare. The physician compensation was less than \$1,000 from 79% of the patients covered by Medicaid and 87% of the uninsured patients. For stress test interpretation, physicians received \$80 or more from 93% of the patients covered by private insurance and from 83% of the patients belonging to an HMO, but they received

that much from fewer than 0.4% of the patients for whom Medicare was the primary insurer. The physician compensation was less than \$40 from 91% of the patients with Medicaid and 65% of the uninsured patients.

Stratified Analysis: Patient Characteristics and Payment, by Insurance Group

The association of total physician compensation with patient characteristics became much weaker after stratifying for insurance status, and in most cases it was no longer statistically significant. Within the group of patients with private insurance who underwent percutaneous transluminal coronary angioplasty, physicians received \$2,500 or more from 95% (260/274) of the patients 40 to 64 years old, 93% (42/45) of the patients 65 to 74 years old, and 100% (4/4) of the patients 75 years and older ($P = 0.9$); 95%

Table 1. Total Physician Compensation for Angioplasty and Stress Test Interpretation, by Patient Characteristics*

| Patient Characteristics | No. | Total Physician Compensation, % | | |
|---|-------|---------------------------------|-----------------|----------|
| | | <\$1,000 | \$1,000-\$2,499 | ≥\$2,500 |
| Percutaneous Transluminal Coronary Angioplasty | | | | |
| Age, y | | | | |
| 40-64 | 405 | 15.3 | 13.1 | 71.6 |
| 65-74 | 235 | 5.1 | 73.2 | 21.7 |
| ≥75 | 193 | 2.6 | 94.8 | 2.6 |
| Sex | | | | |
| Male | 545 | 9.7 | 41.5 | 48.8 |
| Female | 288 | 9.0 | 63.2 | 27.8 |
| Race | | | | |
| White | 765 | 7.5 | 50.1 | 42.5 |
| Nonwhite | 68 | 32.4 | 36.8 | 30.9 |
| Stress Test Interpretation | | | | |
| | No. | <\$40 | \$40-\$79 | >\$80 |
| Age, y | | | | |
| 40-64 | 1,693 | 28.5 | 11.3 | 60.3 |
| 65-74 | 893 | 9.7 | 63.9 | 26.4 |
| ≥75 | 608 | 4.0 | 93.9 | 2.1 |
| Sex | | | | |
| Male | 1,919 | 16.1 | 36.5 | 47.4 |
| Female | 1,275 | 22.2 | 49.5 | 28.3 |
| Race | | | | |
| White | 2,448 | 11.0 | 44.6 | 44.5 |
| Nonwhite | 746 | 43.5 | 32.3 | 24.2 |

*All comparisons are statistically significant ($P < 0.001$).

(71/75) of the male patients and 95% (235/248) of the female patients ($P = 0.5$); and 95% (286/302) of the white patients and 95% (20/21) of the nonwhite patients ($P = 0.5$). Among the group of patients with private insurance who underwent stress testing, physicians received \$80 or more from 95% (821/860) of the patients 40 to 64 years old, 88% (180/205) of the patients 65 to 74 years old, and 26% (5/19) of the patients 75 years and older ($P < 0.001$); 95% (733/776) of the male patients and 89% (273/308) of the female patients ($P = 0.003$); and 93% (870/940) of the white patients and 94% (136/144) of the nonwhite patients ($P = 0.8$).

Among the Medicare patients who underwent percutaneous transluminal coronary angioplasty, physicians received between \$1,000 and \$2,500 from 96% (26/27) of the patients 40 to 64 years old, 98% (168/172) of the patients 65 to 74 years old, and 98% (183/187) of the patients 75 years and older ($P = 0.2$);

98% (200/205) of the male patients and 98% (177/181) of the female patients ($P = 0.2$); and 98% (352/361) of the white patients and 100% (25/25) of the nonwhite patients ($P > 0.9$). For interpreting the stress tests of Medicare patients, physicians received between \$40 and \$79 from 97% (143/148) of the patients 40 to 64 years old, 97% (528/542) of the patients 65 to 74 years old, and 99% (535/543) of the patients 75 years and older ($P = 0.4$); 98% (633/648) of the male patients and 98% (573/585) of the female patients ($P = 0.9$); and 98% (992/1012) of the white patients and 97% (214/221) of the nonwhite patients ($P = 0.07$).

Medicaid covers predominately younger individuals, and there were only 38 percutaneous transluminal coronary angioplasty procedures performed in this group. Nevertheless, for patients who were covered by Medicaid, physicians received <\$1,000 for angioplasty from 74% (23/31) of the patients 40 to 64 years old, 100% (6/6) of the patients 65 to 74 years old, and 100% (1/1) of the patients 75 years and older ($P = 0.8$); 73% (19/26) of the male patients and 92% (11/12) of the female patients ($P = 0.6$); and 67% (16/24) of the white patients and 100% (14/14) of the nonwhite patients ($P = 0.06$). For patients with Medicaid who underwent stress testing, physicians received <\$40 from 94% (298/317) of the patients 40 to 64 years old, 81% (38/47) of the patients 65 to 74 years old, and 53% (9/17) of the patients 75 years and older ($P < 0.001$); 91% (143/158) of the male patients and 91% (202/223) of the female patients ($P = 0.8$); and 86% (110/128) of the white patients and 93% (235/253) of the nonwhite patients ($P < 0.01$).

Table 2. Patient Characteristics and Insurance Status*

| Patient Characteristics | No. | Percentage With Given Type of Coverage | | | | |
|---|-------|--|-----|----------|----------|-----------|
| | | Private | HMO | Medicare | Medicaid | Uninsured |
| Percutaneous Transluminal Coronary Angioplasty | | | | | | |
| Age, y | | | | | | |
| 40-64 | 405 | 68 | 10 | 7 | 8 | 8 |
| 65-74 | 235 | 19 | 3 | 73 | 3 | 2 |
| >75 | 193 | 2 | <1 | 97 | <1 | 0 |
| Sex | | | | | | |
| Male | 545 | 45 | 7 | 38 | 5 | 5 |
| Female | 288 | 26 | 3 | 63 | 4 | 3 |
| Race | | | | | | |
| White | 765 | 39 | 6 | 47 | 3 | 4 |
| Nonwhite | 68 | 31 | 1 | 37 | 21 | 10 |
| Stress Test Interpretation | | | | | | |
| Age, y | | | | | | |
| 40-64 | 1,693 | 51 | 10 | 8 | 19 | 11 |
| 65-74 | 893 | 23 | 5 | 61 | 5 | 6 |
| >75 | 608 | 3 | <1 | 89 | 3 | 4 |
| Sex | | | | | | |
| Male | 1,919 | 40 | 8 | 34 | 8 | 9 |
| Female | 1,275 | 24 | 6 | 46 | 17 | 7 |
| Race | | | | | | |
| White | 2,448 | 38 | 8 | 41 | 5 | 7 |
| Nonwhite | 746 | 19 | 5 | 30 | 34 | 12 |

* All comparisons are statistically significant ($P < 0.001$).

... DISCUSSION ...

Our objective was to quantify the relationship between demographic characteristics, physician compensation, and insurance status for two common cardiovascular tests. We found that older age, female sex, and nonwhite race were strongly and negatively correlated with total compensation to

physicians. Although we did not attempt to correlate compensation with rates of referral, the groups associated with lower compensation were reported by other studies to have lower referral rates for cardiovascular services among those with presumed coronary artery disease.^{5,6,8,9,11-13} Other studies also reported associations between physician compensation and characteristic practice patterns,³ although the impact of these associations on clinical practice remains unknown.

The differences in physician compensation by age, sex, and race in our study were largely explained by insurance status. One of the remarkable characteristics of our healthcare system is the diversity in sources of payment for similar physician services. Although some insurers commonly pay the majority of what physicians charge for services, others pay substantially less. This study demonstrates explicitly how the heterogeneity of payment sources in our current healthcare system affects total physician remuneration. We quantify the widely known fact that physicians receive substantially less compensation for angioplasty and stress test interpretation from publicly funded programs than from private insurance or HMOs. The physician payments from state programs were comparable to what physicians receive from uninsured patients.

In our study sample insurance status was strongly associated with patient demographic characteristics. Younger patients, male patients, and white patients were much more likely than older patients and female patients to have private insurance. Younger individuals, women, and nonwhites were more likely than older persons, men, and whites to have Medicaid insurance. Patients older than 65 years were most likely to participate in Medicare Part B.

The precise impact of physician compensation on use of services is not known and is beyond the scope of this study. However, the relationship between patient characteristics, insurance status, and physician compensation may have confounded some of the reported associations between the use of cardiovascular services and the sex of the patient. Steingart and colleagues⁵ and Ayanian and Epstein⁶ employed multivariable analyses to demonstrate that women undergo cardiovascular procedures less often than men. Neither study explored fully whether physician compensation or insurance status could be an explanatory variable. Steingart and colleagues adjusted for 15 demographic and clinical variables in their analysis of patients enrolled in the Survival and Ventricular Enlargement (SAVE) trial,

but they did not adjust for differences in insurance coverage or socioeconomic status. Although Ayanian and Epstein, in their study of patients discharged from hospitals in Massachusetts and Maryland in 1987, did include insurance status in their multivariable model, patients were only coded as insured or uninsured. By this classification, 96% of the men and 97% of the women in their sample were considered together as insured. Because our study shows significant variation in physician compensation among insured individuals, this binary classification as "insured" or "uninsured" would be unlikely to control adequately for differences in reimbursement. Because women are more likely than men to have Medicaid insurance, adjustment for the different types of insurance would have diminished the association between sex of the patient and referral for procedures.

Our study also showed that age was very strongly associated with physician compensation. We found a gradient of decreasing physician compensation with increasing age that extended past the age of 65 years, the time of eligibility for Medicare. Thus, the elderly population is not homogeneous with respect to insurance status or physician payment.

Differences in supplemental insurance coverage may explain this observation. All patients who are at

Table 3. Total Physician Compensation for Angioplasty and Stress Test Interpretation, by Patient Insurance Status*

| Patient Insurance Status | No. | Total Physician Compensation, % | | |
|---|-------|---------------------------------|-----------------|----------|
| | | <\$1,000 | \$1,000-\$2,499 | ≥\$2,500 |
| Percutaneous Transluminal Coronary Angioplasty | | | | |
| Private insurance | 323 | 2 | 3 | 95 |
| HMO | 47 | 2 | 34 | 64 |
| Medicare | 286 | 1 | 98 | 1 |
| Medicaid | 38 | 79 | 13 | 8 |
| Uninsured | 39 | 87 | 3 | 10 |
| Stress Test Interpretation | | | | |
| | No. | <\$40 | \$40-\$79 | >\$80 |
| Private insurance | 1,084 | 2 | 5 | 93 |
| HMO | 230 | 10 | 7 | 83 |
| Medicare | 1,233 | 2 | 98 | <1 |
| Medicaid | 381 | 91 | 7 | 3 |
| Uninsured | 266 | 65 | 12 | 23 |

* All comparisons are statistically significant ($P < 0.001$).

least 65 years old have the benefit of Medicare Part A, but this coverage does not include professional fees. Some patients subscribe to Medicare Part B, which covers 80% of the approved Medicare resource-based relative-value scale (RBRVS) fee, after a small deductible. Although many elderly patients cannot afford Part B, others have supplemental private insurance. Overall, Medicare covers approximately 50% of the medical care expenses of the elderly, and 22% of Medicare recipients have no supplemental private insurance or Medicaid coverage.⁷ Therefore, differences in payment can exist in the population who are 65 years of age or older. Although researchers have reported that increasing age is associated with less frequent referral for tests and procedures, they did not examine the importance of primary insurance status and differences in physician compensation.⁸⁻¹⁰

Finally, race was very strongly associated with physician compensation as a result of insurance coverage. Despite this association, it is unlikely that the studies of race and utilization of cardiovascular services have been confounded by economic factors. When reporting racial differences in the use of cardiac procedures, Wenneker and Epstein¹¹ did adjust for household income. Other studies reported racial differences that appear to be independent of economic forces. Hannan and colleagues,¹² in a study reporting an association between race and cardiac procedures in New York State, adjusted for payer and median household income. Whittle and colleagues,¹³ in a study that correlated race with the use of cardiovascular procedures, used the Department of Veterans Affairs Medical System to examine the issue in a system that was indifferent to a patient's ability to pay.

A limitation of this study is its focus on compensation for two common cardiovascular services in a single cardiology practice. Nonetheless, there is no reason to suspect that the cardiology practice's experience with these two services differs from experience with other services or other fields within medicine. This cardiology practice did, however, have fewer patients belonging to an HMO than is common in other areas.¹⁴ A strength of this study is that we were able to assess the total amount received from, or on behalf of, each patient for the service performed. Our calculations represent the total amount of money received from all sources for consecutive patients over an 18-month period. We evaluated the total payment received by the physicians from, or on behalf of, each patient more than 7 months after the service was rendered.

Despite the varying rates of compensation from Medicaid throughout the country, Medicaid payments to physicians in Connecticut approximate the national average.¹⁵

This study has important policy implications as the healthcare system considers alternative methods of payment. The demonstrated disparity in physician compensation by type of insurance led to substantial differences in physician compensation by patient age, sex, and race. Our study shows that the system in 1992-93 provides relatively greater financial rewards for treating younger patients, men, and whites as a result of patterns of insurance coverage. These differences parallel reports about utilization rates for cardiovascular procedures by patient age, sex, and race.⁴ Physicians received substantially less compensation from groups reported to be underserved.

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