

Changes in Medicare Reimbursement in Colorado: Impact on Physicians' Economic Behavior

by Thomas Rice and Nelda McCall

In 1976 there was a change in Medicare reimbursement policy in the State of Colorado. This study analyzes the impact of that change on physicians' economic behavior. Through 1976, prevailing charges (one of the determinants of the level of physician reimbursement under Medicare) were computed separately within each of 10 regions of Colorado. Since then, they have been computed for the State as a whole, and thus, physicians in like specialties have had equal prevailing charges throughout the State. This change in reimbursement policy led to a relative increase in prevailing charges for physicians in small urban and nonurban areas of the State, and a relative decrease for physicians in the major urban areas.

In this paper we analyze the impact of this change on several aspects of physician behavior. We found that physicians whose reimbursement rates declined as a result of the change—primarily those in the Denver/Boulder area—provided more-intensive medical services, had lower assignment rates, and charged lower prices than they would have in the absence of the change. Those physicians whose reimbursement rates increased as a result of the change—primarily those in small urban and non-urban areas of Colorado—provided less-intensive services, had higher assignment rates, and charged higher prices than they would have otherwise. We did not find any evidence that physicians responded to the change by altering the number of laboratory tests and X-rays they provided.

Introduction

In recent years a great deal of interest has been focused upon developing appropriate ways for third-party payers to reimburse physicians for the services they provide. Finding satisfactory methods of reimbursement is particularly difficult because policymakers would like the reimbursement system to simultaneously fulfill several potentially conflicting goals: ensuring high quality and appropriate care, providing suitable access (both financial and geographic) to medical services, and containing costs (both program disbursements and cost of administration). Public medical care programs such as Medicare and Medicaid have been under some pressure to develop more efficient and equitable reimbursement mecha-

nisms, and most likely this pressure will become greater if future budgetary constraints limit or reduce the amount of resources that can be devoted to these programs.

This study examines a change in Medicare's physician reimbursement system that occurred in Colorado during 1976, and how the change affected the economic behavior of physicians within the State. At that time, Colorado changed from an area-wide to a State-wide system for the purpose of calculating prevailing charges—one of the determinants of the size of Medicare's payment to physicians for delivery of services to program beneficiaries. As a result of the change, prevailing charges were equalized for all physicians in a given medical specialty, where previously they tended to be higher in the major urban areas of the State. While this change, or others like it, could in the long-run lead to a more even geographic distribution of physicians, in this paper we examine its short-term

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impact on the output and pricing behavior of Colorado physicians within the Medicare program. By examining physicians' responses, policymakers may be better able to predict the short-term economic impact of various alternatives to present reimbursement practices.

Physician Reimbursement Under Medicare

A brief review of Medicare reimbursement policies is necessary to provide an institutional context for the study. Medicare, the nation's largest public medical care program, is divided into two parts: Part A, Hospital Insurance, and Part B, Supplementary Medical Insurance. Physicians are reimbursed under Part B by the "customary, prevailing, and reasonable" (CPR) charge system. This system is used to determine the amount of Medicare reimbursement for each Medicare service delivered by physicians. This reimbursed amount is known as "reasonable charge," and will be referred to as such in the remainder of this paper. In the absence of special medical circumstances, the reasonable charge for a procedure provided by a given physician during a given fiscal year is defined as the *lowest* of:

- The submitted or billed charge for the procedure.
- The "customary" charge for the procedure by that physician (defined as the physician's median charge for that service during the previous full calendar year).
- The "prevailing" charge for the procedure by physicians in that particular medical specialty and geographic area (defined as the 75th percentile of physician charges for physicians in that specialty and geographic area during the previous full calendar year).

Physicians have a choice as to whether they will accept "assignment" under the Medicare program. The percentage of services accepted on assignment is called the assignment rate. If a physician accepts a service on assignment, he or she agrees to accept Medicare's reasonable charge as payment in full. In such a case, the physician receives payment (less the usual 20 percent patient copayment and any outstanding deductible paid by the patient), directly from the Medicare program. If the physician does not accept a service on assignment, the patient must pay not only the deductible and the copayment, but also the difference between the physician's billed charge and the Medicare reasonable charge. In such a case, Medicare pays the reasonable charge directly to the patient, who in turn is responsible for paying the entire physician bill. The advantage to physicians of nonassigned services is that their revenue is not con-

strained by the reasonable charge; the advantage of assigned services is that the chance of patient default is eliminated because Medicare directly pays the physician for the service. From a policy standpoint, and from the standpoint of beneficiaries, assigned claims are desirable because the patient is not liable for any payment exceeding the reasonable charge; thus, out-of-pocket expenditures for patients are lower, as are overall health care costs.

In recent years, Medicare's CPR system of physician reimbursement has come under increasing criticism from health care researchers who have concluded that it provides incentives for physicians to behave in ways that are contrary to policy goals. For example, in a recent set of studies conducted by the Urban Institute (Holahan *et al.*, 1979), the authors studied various aspects of the Medicare and Medicaid reimbursement systems by using a large data base from California for the period 1972-1975. Based on these studies, they concluded that:

[the CPR system] should be eliminated. The CPR method preserves large differences in payments to individual physicians in the same medical specialty and geographic area for performing the same procedure, and is thus inequitable to physicians. It has an inherent inflationary incentive, because the next year's program reasonable charge levels are based on this year's actual charges. Lastly, CPR does nothing to increase physicians' willingness to treat poor or elderly patients. It has no effect on and in fact maintains, the gap between what physicians are paid for treating Medicare assignment or Medicaid patients and what they receive from privately insured and self-paying patients (p. 35).

In another recent study, Burney, Schieber, Blaxall, and Gabel (1979) conducted an extensive analysis of the physician incentives inherent in the Medicare reimbursement system. Using both Medicare claims data and the findings of other researchers, the authors found that the CPR system appears to encourage physicians to:

- charge higher fees, because Medicare's reasonable charge in following years is calculated from billed charges in the current year.
- practice in metropolitan areas. In 1975, prevailing charges were 33 percent higher in counties having 175 physicians/100,000 population than in counties with fewer than 75 physicians/100,000 persons.
- provide more technologically intensive and costly care, because remuneration per unit of time was considerably higher for inpatient care than for outpatient care, and for surgery than for nonsurgical treatment.

Although the authors believe that financial incentives may play only a small role in a physician's decisions regarding choice of specialty and location, they note that,

Nevertheless, from a Federal policy perspective, Medicare and Medicaid reimbursement practices should support, or at least not contradict, government policies to attract physicians into shortage specialties and underserved areas (p. 67).

Description of the Study

The Change in Colorado's Prevailing Charge Methodology

The purpose of this study is to examine how physicians reacted to a change in Medicare reimbursement policy that occurred in Colorado. Through fiscal year 1976, Medicare prevailing charges were computed separately for every medical specialty and for each of 10 geographic regions within Colorado. Beginning with fiscal year 1977, all Colorado physicians in like specialties were grouped together for the purpose of calculating prevailing charges.¹ As a result of this change, physicians practicing in regions that formerly had lower-than-average prevailing charges experienced a relative increase in Medicare's prevailing charges, while physicians in higher-than-average areas (primarily the Denver/Boulder area) experienced a relative decrease. The change, therefore, provides us with a natural experiment to examine physicians' economic behavior.

Because urban physicians tended to have higher prevailing charges than did their non-urban counterparts prior to the change, it represented a step toward equalizing physician reimbursement in urban and non-urban areas, regardless of differences that may have existed in practice costs in different areas of the State. Additionally, depending upon how physicians reacted to the change, it had the potential to control increases in Part B Medicare program costs. While the study period (fiscal years 1976 to 1978) is not long enough to allow us to examine the impact on physician location decisions, the change did provide a "natural" experiment with which to test how physicians may have altered their short-term pricing, output, and assignment decisions—items of major interest to policymakers—as a result of changing reimbursement rates.

¹As of fiscal year 1979, approximately one-third of the States used Statewide rather than area-wide prevailing charge reimbursement methodology (Health Care Financing Administration, 1979).

Data Sources

Five data sources were used in this study:

- Information from all Part B Medicare claims submitted by Colorado physicians during fiscal years 1976 and 1978, obtained from Blue Cross/Blue Shield of Colorado, the State's Medicare carrier.
- Prevailing charges during fiscal years 1976, 1977, and 1978 for 24 common medical procedures of general practitioners, general surgeons, and internists, obtained from the carrier.
- Demographic and practice information on all Colorado physicians, obtained from the Blue Cross/Blue Shield provider files and from the 1979 American Medical Association Directory of Physicians.
- Information on health manpower, health facilities, and population characteristics, aggregated on a county level, from the Area Resource File compiled by the Bureau of Health Manpower in the Department of Health and Human Services (HHS).
- Information on wages in the health care sector, also aggregated on a county level, from the Bureau of the Census.

The Medicare claims data contain the following information: patient and physician identification numbers; billed charge, reasonable charge, an indicator of assignment status, place and type of each service delivered; an indicator of whether the patient was also eligible for Medicaid; and an "action code" that indicates any special characteristics of that claim. The physician demographic and practice information includes provider sex, medical school attended, year of license, specialties, and board certification. The county-specific information from the Area Resource File includes for each county, the urbanization level, numbers of physicians in different medical specialties, and measures of average socioeconomic status—such as *per capita* income.

For this study, an analytic file was constructed containing one record for each of the 1,318 general practitioners, internists, and general surgeons in Colorado who practiced in fiscal years 1976 and 1978 and who did not change medical specialty or move to another of the 10 regions of the State within that period.² It was not possible to include more specialties in the study because there were very few physicians in non-urban areas. As a result, they were grouped with those from the Denver/Boulder area for purposes of computing prevailing charges. Thus, when the change in prevailing charge policy took place, there was no differential impact.

²Physicians who changed specialties were not included because in doing so they would have faced different prevailing charges that were independent of the change in policy. Those moving from one geographic area to another were also excluded because their change in practice location could have led to changes in their economic behavior that were also unrelated to the policy change. It is highly unlikely that any physicians moved as a result of the change.

Empirical Results

In the remainder of the paper we present the results of our analysis. Two types of analysis were conducted: an exploratory or descriptive analysis, and a multivariate analysis. The purpose of the descriptive analysis was to determine whether there were any changes over the study period in aggregate physician supply or in pricing behavior in Colorado. Multivariate analysis was then used to isolate whether there is a significant relationship between the change in prevailing charge policy and the behavior of individual physicians (when other factors are held constant).

Descriptive Analysis

Before examining the impact of the change in policy on physician behavior, it is important to examine the magnitude of the impact on prevailing charges throughout Colorado. Through fiscal year 1976, prevailing charges were calculated separately by specialty and area; subsequently, areas were combined so that the charges were calculated separately only for each specialty. Consequently, the change-over had a differential impact on physicians both in different specialties and within the same specialties practicing in different geographic areas.

Table 1 shows the initial effect of the changeover on prevailing charges, as measured by the percent change in prevailing charges per RVU³ between fiscal years 1976 and 1977 for a standardized mix of 24 common medical services by area and specialty.⁴ Area 1, Denver/Boulder, is by far the largest urban area in Colorado, with a Standard Metropolitan Statistical Area (SMSA) population of almost 1.5 million during the study period. Area 6 contains Colorado Springs, the second most populous SMSA, with almost 300,000 people. Much smaller SMSAs, each with approximately 100,000 population, exist in Area 2 (Fort Collins and Greeley) and in Area 8 (Pueblo). The remaining areas of the State are primarily non-urban.

³RVUs are relative value units. Each medical procedure is assigned an RVU that represents the intensity of the procedure. Thus, an RVU represents a standard unit of quantity across different medical procedures. RVUs are constructed separately for services categorized into one of five types—medical, surgical, radiological, pathologic, and anesthesiologic services—which allows comparisons within but not between procedure codes in these categories. During the study period, Colorado used 4-digit RVUs adapted from the 1964 *California Relative Value Study*. We have used RVUs throughout the analysis because, within the five types of services, it provides a common measure of physician output, allowing us to calculate prices and assignment rates weighted by this common measure of output.

⁴These 24 procedures include all common medical outpatient, inpatient, and home medical services provided by physicians (codes 9000-9008, 9010-9017, 9020-9027, and 9039). While it would have been desirable to have a larger sample of medical procedures from which to calculate these averages, as well as representative surgical procedures, the carrier provided us with prevailing charges for only the ones listed here.

TABLE 1

Percent Increase from 1976 to 1977 in Prevailing Charges per RVU By Specialty and Area

Area Code	Geographic Area	Specialty		
		General Practice	Medicine	General Surgery
1	Denver/Boulder	2.9	7.1	2.3
2	North Central (Fort Collins and Greeley)	16.5	23.3	11.2
3	Northwest	9.0	15.6	15.2
4	West	20.2	32.8	19.9
5	Northeast	22.8	7.1	2.3
6	Colorado Springs	2.8	11.7	11.2
7	Central/South Central	20.8	13.3	10.6
8	South Central (Pueblo)	21.1	36.9	30.2
9	Southeast	32.9	7.1	8.5
10	Southwest	21.6	7.1	12.4
Average Increase in Charge Among All Areas by Specialty		8.6	10.9	7.3

Looking first at general practitioners (GPs), it is clear that GPs in Area 1 (Denver/Boulder)—the major population center—and Area 6 (Colorado Springs) experienced much smaller increases in prevailing charges than did GPs in the other eight areas. Although increases in Areas 1 and 6 were less than 3 percent between fiscal years 1976 and 1977, six of the eight remaining areas had increases in excess of 20 percent. The patterns were slightly different for internists and general surgeons. Internists in Areas 1, 5, 9, and 10 had somewhat lower increases than those in other parts of the State, while surgeons in Areas 1 and 5 had relatively small increases in comparison to those in the other eight State regions. Overall, in each of the three specialties, physicians in the Denver/Boulder area tended to be the relative "losers" as a result of the policy change, while in most other areas physicians gained. The only reason that some of the other regions (Area 5 for surgeons, and Areas 5, 9, and 10 for internists) also experienced such small increases was that these areas had so few internists and surgeons (5 or fewer) that even before the 1976 change they were grouped with Denver physicians for the purpose of calculating prevailing charges. In general, however, the effect of the change was to provide a relative increase in prevailing charges for physicians outside of the major population centers of the State at the expense of physicians in the urban areas.

Tables 2-5 show how certain characteristics of physician practice changed in Colorado by 1978, following the change in prevailing charge methodology.⁵

⁵All comparisons are between fiscal years 1976 and 1978. Fiscal year 1978 was chosen rather than 1977 because it would allow physicians a year to detect and adjust to any changes in Medicare reimbursement resulting from the policy change.

Specifically, they show changes in submitted charges, assignment rates, provision of ancillary services, and the intensity of services delivered to Medicare patients, all of which could have been altered by physicians in reaction to the changes they experienced in Medicare reimbursement. These changes refer to aggregate changes over the study period, rather than changes by individual physicians. In effect, this means that there is only one observation in each of the 10 State areas. The regression results that follow allow for tests of significance, and also isolate the impact of the change from certain other factors that may have affected the behavior of individual physicians over the study period.

For convenience, physicians in each of the three specialties have been divided into two groups: (1) those experiencing relative decreases in prevailing charges (Areas 1 and 6 for general practitioners (GPs), Areas 1, 5, 9, and 10 for internists, and Areas 1 and 5 for surgeons); and (2) those experiencing relative increases in prevailing charges.⁶ Although this grouping is somewhat arbitrary in that it puts together physicians experiencing relative increases regardless of magnitude, it does provide a straightforward way to compare physicians who were affected by the change in different ways.

We first examine changes in the submitted charges (prices) of physicians. Submitted charges affect payments for physician services under the Medicare program in three ways. First, they determine the size of the Medicare reasonable charge when it is lower than the customary and prevailing charge. Second, when, as is usually the case, the submitted charge exceeds the Medicare reasonable charge, the patient is responsible for paying the difference (in addition to the 20 percent coinsurance and any outstanding annual deductible) when the service is not delivered on assignment. Finally, physicians' current charges partially determine the next year's customary charges, which in turn may affect program reimbursement. Thus, higher submitted charges will tend to increase Medicare program costs as well as patient out-of-pocket costs.

Table 2 provides the aggregate percent change in submitted charges per medical RVU⁷ and per surgical RVU between fiscal 1976 and 1978 for each of the three specialties. In general, physicians experiencing relative increases in prevailing charges raised their

⁶The terms "relative increase" and "relative decrease" refer to how physicians' prevailing charges changed, relative to the mean change among all physicians in that specialty. They may also be interpreted as the change in prevailing charges relative to inflation during 1976 to 1977—approximately 9 percent nationwide in the physicians' services component of the Consumer Price Index.

⁷Medical services include all procedure codes from 9000 to 9069 in the 1968 *Colorado Relative Value Study*, adapted from the 1964 *California Relative Value Studies*. These include all medical physician services, inpatient, outpatient, and home services, but exclude diagnostic services such as EKGs.

submitted charges more than physicians whose prevailing charges rose more slowly (that is, the "relative decrease" group). For example, with respect to submitted charges per medical RVU, GPs in the "relative increase" category raised charges by 14.5 percent over the period, compared to 10.4 percent for the "relative decrease" group. Internists followed this pattern, but with a smaller difference between groups (19.5 percent vs. 18.8 percent), and surgeons showed a marked difference (17.4 percent vs. 9.1). With regard to surgical charges, the same pattern held for GPs and internists: physicians experiencing relative increases in prevailing charges raised their prices more than the other physicians (17.1 percent vs. 15.5 percent for GPs and 24.8 percent vs. 15.1 percent for internists). The only case where this pattern was broken was for surgeons' charges for surgical procedures. Those experiencing relative decreases in prevailing charges raised prices slightly more than those with relative increases (18.8 percent vs. 18.1 percent). In summary, Table 2 indicates that physicians benefiting from the change in prevailing charge policy tended to raise their prices more than those whose reimbursements were adversely affected by the change. Whether these differences were significant while holding other factors constant is examined in the regression analysis that follows.

Next we examine assignment rates. From a policy standpoint, higher assignment rates are desirable because patients will usually face a smaller financial burden when physicians accept assignment—a financial burden determined by the Medicare program (comprised of coinsurance and deductibles) rather than by the physician. Table 3 shows the absolute and percentage changes in the percent of medical and surgical RVUs delivered on an assignment basis between 1976 and 1978 for each specialty (excluding mandatory assigned joint Medicare/Medicaid services). Looking at the absolute changes, assignment rates fell throughout the period by between 2.3 percent and 6.4 percent. However, a pattern emerges from the table that holds in almost every case: physicians in areas experiencing the relative decrease in prevailing charges decreased their rates more than the other physicians did. Looking first at medical services, GPs experiencing the relative decrease in prevailing charges lowered their rates .5 percent more (-4.8 percent vs. -4.3 percent), IMs by 1.7 percent more (-4.0 percent vs. -2.3 percent), and surgeons by .9 percent more (-4.8 percent vs. -3.9 percent). The same pattern existed for the surgical assignment rate among GPs and surgeons, but did not hold for internists. For the latter specialty, the surgical assignment rate declined by 4.6 percent for those experiencing the relative increase in prevailing charges, versus 3.3 percent for the others. However, in every other case, Table 3 indicates that physicians who were adversely affected by the policy change reduced their assignment rates by larger amounts than physicians

TABLE 2
Percent Change From 1976 to 1978 in Submitted Charge Per
Medical RVU and Per Surgical RVU by Specialty
and Prevailing Charge Grouping

	General Practice		Internal Medicine		General Surgery	
	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase
Submitted charge per medical RVU	10.4	14.5	18.8	19.5	9.1	17.4
Submitted charge per surgical RVU	15.5	17.1	15.1	24.8	18.8	18.1

TABLE 3
Change in Percent From 1976 to 1978 of Medical and
Surgical RVUs Delivered On An Assignment Basis
By Specialty and Prevailing Charge Grouping*

	General Practice		Internal Medicine		General Surgery	
	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase
1976 rate, medicine (%)	36.3	40.4	29.9	26.3	40.9	44.8
1978 rate, medicine (%)	31.6	36.1	25.9	24.0	36.0	40.9
Absolute change (%)	- 4.8	- 4.3	- 4.0	- 2.3	- 4.8	- 3.9
Percentage change (%)	- 13.2	- 10.6	- 13.4	- 8.7	- 11.7	- 8.7
1976 rate, surgery (%)	28.2	35.9	27.7	21.4	48.2	41.3
1978 rate, surgery (%)	22.2	31.4	24.4	16.9	41.7	36.6
Absolute change (%)	- 6.0	- 4.5	- 3.3	- 4.6	- 6.4	- 4.7
Percentage change (%)	- 21.3	- 12.5	- 11.9	- 21.5	- 13.3	- 11.4

*Excluding mandatory assigned joint Medicare/Medicaid services

who benefited from the change. Again, whether these differences were significant, other factors held constant, will be examined later in this paper through regression analysis.

We next examine the delivery of ancillary services: X-rays and laboratory tests. It has been posited by other researchers (Blumberg, 1979; Reinhardt, 1978) that physicians may attempt to reach income goals by ordering more X-rays and laboratory tests. If this should occur, higher costs would result for both the Medicare program and Medicare beneficiaries. Table 4 examines how the proportion of radiology and laboratory RVUs per medical RVU changed between 1976 and 1978 among GPs and internists.^a When we look at the first row, radiology, no pattern seems apparent. Although GPs who experienced a relative decline in prevailing charges increased the provision of these services compared with the other group of physicians, the opposite was the case for internists. However, there may be a pattern for laboratory tests, the second row of Table 4. For both specialties, those experiencing a relative decline in prevailing charges increased the ratio of laboratory RVUs to medical RVUs by more than the other physicians; this was especially true among GPs (15.6 percent vs. 6.9 percent). Thus, there is some possibility that the policy change stimulated the provision of more laboratory tests among those physicians whose reimbursements were adversely affected, although this was not borne out by the multivariate results, as discussed below.

^aGeneral surgeons were not included because they billed relatively few laboratory tests and X-rays directly.

TABLE 4

Percent Change from 1976 to 1978 in Radiology and Laboratory RVUs Delivered Per Medical RVU By Specialty and Prevailing Charge Grouping

	General Practice		Internal Medicine	
	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase
Percent change in radiology RVUs per medical RVU	1.2	- 8.8	- 3.9	1.6
Percent change in laboratory RVUs per medical RVU	15.6	6.9	21.2	20.0

Finally, we examine changes in the intensity of medical services delivered. A frequent criticism of the current practice of using relative value scales for physician reimbursement is that they provide the opportunity for physicians to re-evaluate service intensity and bill for more-intensive services, and thus receive greater reimbursements. One method of investigating this possibility is to examine the average number of RVUs delivered per service. Higher ratios indicate that more-intensive services are being billed by physicians. Table 5 shows the percent change in RVUs delivered per medical service between 1976 and 1978 in each specialty. Medical rather than surgical procedures were examined because physicians have a greater amount of flexibility in choosing medical procedure codes for a given service. Although the intensity of services did increase over the 2 years (all changes are positive), this table does not show major differences in the increase in intensity between physicians who experienced relative increases vs. relative decreases as a result of the policy change. GPs and internists in each of the two groups had similar changes in this ratio; general surgeons experiencing the relative decreases in prevailing charges, however, did raise the ratio somewhat more than the other physicians did. However, the multivariate results discussed below show a significant negative relationship between changes in reimbursement and service intensity for all three specialties.

TABLE 5

Percent Change From 1976 to 1978 in RVUs Delivered Per Medical Service by Specialty and Prevailing Charge Grouping

General Practice		Internal Medicine		General Surgery	
Relative Decrease	Relative Increase	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase
7.0	6.8	0.3	0.6	6.8	5.8

Multivariate Analysis

To test the impact of the change in prevailing charge methodology on physicians' economic behavior, we employed a three-step process. First, we established the relationship between changes in prevailing charges and changes in reasonable charges. Prevailing charges are important insofar as they affect the Medicare reasonable charge. Second, we established the relationship between changes in reasonable charges and changes in physicians' supply and pricing variables over the study period. These results are of interest because they indicate how individual physicians reacted to changes in their Medicare reimbursement levels. In the third step, we combined the results from the first two steps and estimated the impact that the Colorado change in prevailing charge methodology had on the behavior of physicians within the State. This indirect method of estimating the effect of the policy change was used because it is hypothesized that physicians respond to the reasonable charge (Hadley and Lee, 1978; Sloan, Cromwell, and Mitchell, 1977), not the prevailing charge.

The Relationship Between Changes in Prevailing Charges and Changes in Reasonable Charges

Because our data base did not include information on physicians' customary charges, it was not possible to determine when the prevailing charge was the determinant of the reasonable charge (that is, when it was lower than the submitted and customary charges). In a recent study by the General Accounting Office (1979), it was found that among six Medicare carriers sampled, three reported that the customary charge was most often the determinant of physicians' reasonable charges, two reported that the prevailing charge was most often the determinant, and one reported that customary and prevailing charges were equally often the determinant. Because customary and prevailing charges are calculated separately for each procedure code, a physician could find prevailing charges lower than his or her customary charges for some procedure codes, but customary charges lower than prevailings for others. Furthermore, for a given service billed, the submitted charge is sometimes lower than the customary or prevailing charge. Consequently, in order to determine the relationship between prevailing charges and reasonable charges, we regressed changes in average reasonable charges per medical RVU on changes in average prevailing charges per medical RVU, for each physician in each specialty.³ The means of these variables appear in

³As discussed in footnote 4, changes in prevailing charges were calculated from a sample of 24 common medical procedures. Changes in reasonable charges per RVU were calculated over all medical procedures delivered.

Table 6. However, rather than reporting mean changes, we report mean levels over the sample period in order to calculate elasticities.

The results from this regression, shown in Table 7, establish an average relationship between prevailing and reasonable charges among physicians in each of the three specialties. The results for the GP regression can be interpreted as indicating that a 1¢ increase in prevailing charges per medical RVU would lead to a .418¢ increase in reasonable charges per RVU. However, it is more useful to interpret these results as elasticities, by using the mean values and calculating the percent change in reasonable charges divided by the percent change in prevailing charges. By doing this, we find that:

- For GPs, a 10 percent increase in prevailing charges (at the mean) would lead to a 4.7 percent increase in reasonable charges.
- For internists, a 10 percent increase in prevailing charges would lead to a 5.3 percent increase in reasonable charges.
- For surgeons, a 10 percent increase in prevailing charges would lead to a 2.5 percent increase in reasonable charges.

TABLE 6

Mean Values of Variables by Specialty (average of 1976 and 1978 values)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Reasonable charge per RVU*	\$2.06	\$2.45	\$2.13
Prevailing charge per RVU*	\$2.32	\$2.61	\$2.33

*Change between fiscal years 1976 and 1978 used in regressions.

For GPs and internists, the results were significant at the 1 percent level, and for surgeons they were significant at the 10 percent level.

These results seem to be very plausible. We would expect that increases in prevailing charges would lead to increases in reasonable charges, and furthermore, that the relationship would be less than proportional. For an individual physician, increases in prevailing charges will lead to concomitant increases in reasonable charges only in cases where the prevailing charge is lower than the physician's submitted charge for the service and the physician's customary charge for the procedure. The fact that general surgeons had a weaker relationship between the two variables indicates that their reasonable charges were constrained more frequently by the customary or submitted charges after the policy change. However, because data on customary charges were not available, this hypothesis could not be examined more closely.

TABLE 7.

Regression Results of Change from 1976 to 1978
in Reasonable Charge (\$) Per Medical RVU,
(standard errors in parentheses)

Independent Variable	Specialty		
	General Practice	Internal Medicine	General Surgery
Change in prevailing charge per RVU	.481*** (.068)	.496*** (.084)	.227* (.122)
CONSTANT	.054 (.025)	.137 (.047)	.138 (.040)
R ²	.062	.076	.013
F	37.7***	35.1***	3.45*
N	568	428	264

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

The Relationship Between Changes in Reasonable Charges and Changes in Physician Supply and Pricing Behavior

From a policy standpoint, perhaps the most important aspect of the empirical analysis is the determination of how changes in Medicare reimbursement levels (reasonable charges) received by individual physicians affected their economic behavior. The results from Tables 2 through 5 indicate that the change in prevailing charges policy may have had an effect on physicians' submitted charges, assignment rates, the ordering of laboratory tests, and the intensity of services, through its impact on reasonable charges. In the regressions we test whether, in fact, changes in Medicare reimbursement rates have been the causes of these changes. It should be noted, however, that three factors limit the analysis: lack of data before 1976, which prevented us from exploring whether changes in physician behavior between 1976 and 1978 are part of an existing trend; lack of data on physicians' non-Medicare practice¹⁰; and the relatively short time frame (2 years).

In these regression models, the unit of analysis is the individual physician. Separate models are estimated for each of the three specialties to allow for the possibility of different responses to changes in reimbursement rates. In the models, each of the dependent variables is regressed on the same set of the independent variables.

Both the dependent variables and the independent variable of primary interest (the reasonable charge) are entered into the equations as absolute differences between 1976 and 1978 values. Changes in these variables rather than levels were used for two reasons. First, use of changes helps reduce the spurious correlation between the dependent variables and the Medicare reimbursement rate.¹¹ Second, in this study we are primarily interested in how individual physicians react to *changes* in reimbursement rather than the *level* of reimbursement. Several other variables have been included in the models to account for any variation in the dependent variable resulting

¹⁰This causes two problems. First, as Hadley and Lee (1978) have pointed out, physicians who participate in the Medicaid program would be expected to react differently to Medicare reimbursement levels than would nonparticipating physicians. However, our data set does not permit us to distinguish between these two groups. Second, because we do not have non-Medicare practice information, we cannot determine if changes in physicians' Medicare decisions are reflective of changes in their non-Medicare practice. However, other researchers have found that physicians charge similar prices to Medicare and non-Medicare patients (Gabel, 1980a).

¹¹The most serious problem with spurious correlation in the "level" equations would probably occur when regressing submitted charge on the reasonable charge, because submitted charges in the previous year are a determinant of current reasonable charges. Therefore, to the extent that a physician's submitted charges are correlated over time, we would expect some problem with spurious correlation.

from factors other than changes in Medicare reimbursement. These include several physician-specific variables (such as experience and board certification status), as well as characteristics of the physician's county of practice.

Five physician characteristics are included as independent variables; dummy variables indicating whether the physician is part of a group, board certified, a foreign medical graduate, or an osteopath, and a continuous variable indicating the number of years of experience (specifically, years since graduation from medical school). The board certification, experience, and foreign graduate variables are included as proxies for both quality and for the physician's implicit wage. It may be hypothesized, for example, that more-experienced physicians may have reacted differently than less-experienced ones to the change in prevailing charge methodology, because they had already built up their practices and could afford to change their assignment rates and prices with less risk of losing patients. The dummy variable for group practice is included to allow for the fact that group practices may be more informed about changes in Medicare reimbursement, and may have specific strategies to deal with them. The dummy variable for osteopaths is included because the market for osteopathic services may be different than for other doctors' services.

Three other sets of independent variables, specific to the physician's county of practice, are also included. Dummy variables representing urbanization are included to allow for variation in the dependent variables between urban and non-urban physicians that was independent of the prevailing charge changeover. In addition, a variable representing the change in physicians per 1,000 population is included to account for changes in physician behavior resulting from changes in market competition, rather than from the policy variable. Finally, a variable representing changes in the wages of health care personnel is included to account for changes in physician behavior resulting from input costs rather than the prevailing charge changeover.

The variables used in the regressions are defined in Exhibit 1.

Table 8 presents the means for each of the variables by specialty. However, rather than reporting the mean changes in variables, we have reported mean levels over the sample period (the average between 1976 and 1978 values), which makes it possible to calculate elasticities from the regression results that follow. With regard to the variables of primary interest, Table 8 shows that GPs had lower submitted and reasonable charges than the other two specialties; for medical services, these charges were highest among the internists, while for surgical services they were highest among surgeons. Furthermore, surgeons had the highest assignment rates while internists had the lowest. Internists and surgeons provided considerably more-intensive services than did GPs.

Independent variables other than reimbursements show that for group practice, internists were involved most often and GPs were involved least often. Internists were also somewhat younger (had fewer years of experience) than were the other two specialties. An equally high proportion of internists and surgeons were board certified (65 percent), compared to 23 percent of the GPs. Finally, internists practiced more frequently in large SMSAs than did surgeons, and surgeons were more concentrated in these areas than were GPs. Of the three specialties, GPs were most likely to practice in semi-rural and rural areas, while internists were the least likely to practice in such areas.

TABLE 8
Mean Values of Variables by Specialty
(average of 1976 and 1978 values)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Dependent Variables			
Medical price/RVU*	\$2.55	\$3.04	\$2.69
Surgical price/RVU*	\$5.22	\$6.34	\$7.24
Med assign rate*	30%	26%	37%
Surg assign rate*	29%	25%	38%
Lab RVUs/med RVU*	.05	.08	—
RVUs/med service*	4.81	5.68	5.53
Independent Variables			
Reimbursement			
Med reas charge/RVU*	\$2.06	\$2.45	\$2.13
Surg reas charge/RVU*	\$4.30	\$5.37	\$5.99
Physician Characteristics			
Group	12%	26%	18%
Experience (years)	22	19	23
Board cert	23%	65%	65%
Osteopath	26%	2%	3%
Foreign	3%	2%	4%
County Characteristics			
Urbanization:			
Large SMSA	53%	68%	60%
Small SMSA	24%	25%	25%
Semi-rural or rural	23%	7%	15%
MDs per 1,000*	2.0	3.0	2.7
Wage income (\$1,000)*	8.6	9.0	8.7

*Change between fiscal years 1976 and 1978 used in regressions.

Exhibit 1

Variable	Definition
<u>Dependent Variables</u>	
Change in medical price/RVU	Change in average submitted charge per medical RVU between 1976 and 1978
Change in surgical price/RVU	Change in average submitted charge per surgical RVU between 1976 and 1978
Change in med assign rate	Change in percent of medical RVUs assigned between 1976 and 1978
Change in surg assign rate	Change in percent of surgical RVUs assigned between 1976 and 1978
Change in lab RVUs/med RVU	Change in the average number of laboratory RVUs delivered per medical RVU between 1976 and 1978
Change in RVUs/med service	Change in the average number of RVUs delivered per medical service between 1976 and 1978
<u>Independent Variables</u>	
Reimbursement	
Change in med reas charge/RVU	Change in average reasonable charge per medical RVU between 1976 and 1978
Change in surg reas charge/RVU	Change in average reasonable charge per surgical RVU between 1976 and 1978
Physician Characteristics	
Group	A dummy variable indicating whether the physician was part of a group practice
Experience	Number of years since the physician graduated from medical school
Board cert	A dummy variable indicating whether the physician was board certified
Osteopath	A dummy variable indicating whether the provider was an osteopath
Foreign	A dummy variable indicating whether the physician graduated from a foreign medical school
County Characteristics	
Urbanization:	
Large SMSA	A dummy variable indicating that the physician practiced in an SMSA of more than 1 million population
Small SMSA or adjacent	A dummy variable indicating that the physician practiced in a smaller SMSA or an adjacent county
Semi-rural or rural	The control group for the urbanization variable, indicating a semi-rural or rural county
Change in MDs per 1,000	Change in physicians per 1,000 population in the physician's county between 1976 and 1978
Change in wage income ¹	Change in average wages among health sector employees in the county between 1976 and 1978

¹This variable was originally used by Hadley and Lee (1978), who calculated it from Census data by dividing total county payroll for physician offices by the number of employees. However, since many Colorado counties did not have data on physician office payrolls, we instead used payrolls for all health services in the county.

Tables 9 through 12 present the regression results. Table 9 presents changes in submitted charges for medical services; Table 10 shows changes in submitted charges for surgical services; Table 11 shows changes in the assignment rate for medical services; and Table 12 shows changes in the intensity of services. We also conducted three other sets of regressions that are not presented because they were not significant at the 10 percent level for any of the specialties: changes in the assignment rate for surgical services, changes in laboratory services delivered per medical service, and changes in radiology services delivered per medical service.

Table 9 shows results from the regression of changes in submitted charges per medical RVU on changes in reasonable charges per medical RVU¹² and other variables. For each specialty, there was a positive relationship between changes in reimbursement and submitted charges, significant at the 1 percent level. For GPs, the results can be interpreted as indicating that a 1¢ increase in reasonable charges per medical RVU led to a .957¢ increase in submitted charges per medical RVU. It is easier to interpret these results, however, by using the means provided in Table 8 and interpreting them as follows:

- For GPs, a 10 percent increase in reasonable charges per medical RVU (at the mean) would lead to a 7.7 percent increase in submitted charges per medical RVU.
- For internists, a 10 percent increase in reasonable charges per medical RVU would lead to a 6.4 percent increase in submitted charges per medical RVU.
- For surgeons, a 10 percent increase in reasonable charges per medical RVU would lead to a 11.1 percent increase in submitted charges per medical RVU.

Thus, physicians in each specialty appear to have responded to changes in reimbursement by increasing their submitted charges; surgeons showed greatest increases in charges, GPs were next, followed by internists.

The other independent variables are entered primarily to account for variation in the dependent variable not associated with changes in reimbursement. Coefficients for some of these variables were significant for certain specialties. With regard to the physician characteristic variables, internists and surgeons

¹²This variable is not technically exogenous but for all practical purposes can be considered so. Reasonable charges in fiscal year 1978 were computed in part from billed charges from calendar year 1976. The change in prevailing charge methodology occurred in November 1976. However, to the extent that it took at least 2 months for physicians to learn about (from their Medicare reimbursements), assess, and react to the change in policy, the variable is completely exogenous. Even if physician response was faster than this, only a small fraction of the reasonable charges included in this variable can be considered endogenous.

TABLE 9

Regression Results of Change from 1976 to 1978
in Submitted Charge (\$) Per Medical RVU
(standard errors in parentheses)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Independent Variables			
Reimbursement			
Change in medical reasonable charge	.957*** (.064)	.798*** (.076)	1.40*** (.160)
Physician Characteristics			
Group	.052 (.051)	.013 (.047)	.065 (.122)
Experience	-.0007 (.0015)	.0034** (.0017)	.0068* (.0040)
Board cert	0 (.041)	.013 (.043)	-.027 (.103)
Osteopath	-.041 (.038)	-.169 (.141)	-.953** (.273)
Foreign	.096 (.10)	-.201 (.141)	.096 (.254)
County Characteristics			
Urbanization:			
Large SMSA	.013 (.046)	.167** (.080)	.053 (.137)
Small SMSA or adjacent	.089* (.053)	.113 (.094)	.173 (.168)
Semi-rural or rural	—	—	—
Change in MDs per 1,000	-.089 (.117)	-.177 (.335)	-.398 (.481)
Change in wage income (\$1,000)	.185** (.087)	.232 (.133)	.184 (.219)
CONSTANT	-.144 (.136)	-.406 (.204)	-.418 (.391)
R ²	.330	.266	.340
F	24.3***	13.8***	11.4***
N	506	391	232

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

with more experience tended to have larger increases in submitted charges, while the few osteopaths who were surgeons had smaller increases in submitted charges than did other surgeons. Coefficients for the county characteristics show that independent of the reimbursement variable, internists in large metropolitan areas showed higher increases in submitted charges than the semi-rural and rural internists did, and GPs in small metropolitan areas had larger increases in submitted charges than those in semi-rural and rural areas. Finally, GPs in counties that had larger increases in health sector wages over the study period had larger increases in submitted charges than others, perhaps indicating that they were passing higher practice costs into their submitted charges. It should also be noted that changes in submitted charges were insensitive to changes in MDs per 1,000 population, a measure of the competitiveness of the market.

Table 10 presents the results from the regression of changes in submitted charge per surgical RVU on changes in reasonable charges per surgical RVU and the other independent variables. As in the case of medical submitted charges, the coefficients for the reasonable charge variable were positive and significant at the 1 percent level for each of the specialties. As before, using the coefficients along with the means from Table 8, we find that:

- For GPs, a 10 percent increase in reasonable charges per surgical RVU (at the mean) would lead to a 9.4 percent increase in submitted charges per surgical RVU.
- For internists, a 10 percent increase in reasonable charges per surgical RVU would lead to a 10 percent increase in submitted charges per surgical RVU.
- For surgeons, a 10 percent increase in reasonable charges per surgical RVU would lead to a 7.8 percent increase in submitted charges per surgical RVU.

Thus, we see that each specialty appears to have responded to changes in surgical reimbursements (as they did previously for medical reimbursements) by raising their submitted charges. This time, however, the magnitude of the responses was the reverse: internists had the highest rate of increase, while surgeons were least responsive.

A few of the other independent variables were also significant. Physician characteristics variables show that surgeons with more experience had greater increases in their prices than others, and GPs who were osteopaths increased their surgical prices by less than other GPs. With regard to the county characteristics, the only significant results were among the GPs. Those in large SMSAs increased surgical prices by less than GPs in semi-rural and rural areas, while those practicing in counties with higher inflation in health sector wages increased their surgical prices more than the other GPs.

TABLE 10
Regression Results of Change from 1976 to 1978 in
Submitted Charge (\$) Per Surgical RVU
(standard errors in parentheses)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Independent Variables			
Reimbursement			
Change in surgical reasonable charge	1.14*** (.051)	1.19*** (.055)	.946*** (.081)
Physicians Characteristics			
Group	.258 (.211)	.067 (.178)	.025 (.155)
Experience	.0031 (.0063)	.0050 (.0074)	.0135*** (.0051)
Board cert	.013 (.165)	.078 (.175)	.123 (.133)
Osteopath	-.265* (.155)	-.439 (.561)	.109 (.370)
Foreign	-.341 (.387)	.004 (.680)	.282 (.307)
County Characteristics			
Urbanization:			
Large SMSA	-.312* (.181)	-.094 (.316)	.004 (.175)
Small SMSA or adjacent	.286 (.208)	.298 (.373)	-.050 (.214)
Semi-rural or rural	—	—	—
Change in MDs per 1,000	.613 (.467)	-1.21 (1.34)	-.406 (.636)
Change in wage income (\$1,000)	1.30*** (.341)	.810 (.511)	-.088 (.284)
Constant	-1.32 (.528)	-.948 (.792)	.504 (.487)
R ²	.568	.642	.415
F	54.7***	48.1***	15.1***
N	427	280	224

*Significant at the 10% level.
 **Significant at the 5% level.
 ***Significant at the 1% level.

Table 11 shows results of regressions comparing changes in the percent of medical RVUs delivered on an assignment basis with changes in reasonable charges per medical RVU and the other independent variables. For internists and general surgeons, there was a positive relationship between changing reimbursement and changes in assignment rate—significant at the 5 percent level for the internists and the 10 percent level for the surgeons. GPs did not show a significant relationship between assignment rate and changing reimbursement, nor was the regression as a whole significant. Specifically, for internists, the results indicate that a 1¢ increase in reasonable charges per medical RVU led to a .097 percent increase in the percent of medical RVUs delivered on an assignment basis. However, it is easier to interpret the results as follows:

- For internists, a 10 percent increase in reasonable charges per medical RVU (at the mean) would lead to a 2.4 percent increase in the percent of medical RVUs delivered on assignment.
- For general surgeons, a 10 percent increase in reasonable charges per medical RVU would lead to a 2.6 percent increase in the percent of medical RVUs delivered on assignment.¹³

Thus, increasing levels of reimbursement for medical services appear to have led to higher assignment rates for the internists and surgeons, although the results showed no significant response for GPs.

Only a few other variables were significant in the assignment regression. General surgeons who were osteopaths and those residing in counties having greater inflation in health wages raised their assignment rates by lesser amounts than other surgeons. Among internists, those in counties that had larger increases in the number of MDs per 1,000 population raised their assignment rates by greater amounts, perhaps indicating that increased competition in these specialties induced physicians to attract patients by assigning more claims.

¹³These are not elasticities, because they refer to the absolute change in the percentage of services assigned rather than the percent change in the percentage of services assigned. To convert these to elasticities, they should be divided by the assignment rate. Doing so, we find that the elasticity for internists is .91 (that is, a 10 percent increase in reasonable charges would lead to a 9.1 percent increase in the percent of services assigned), and that the elasticity for general surgeons is .71 (that is, a 10 percent increase in reasonable charges would lead to a 7.1 percent increase in the percent of services assigned).

TABLE 11

Regression Results of Change from 1976 to 1978 in Percent (%) of Medical RVUs Assigned (standard errors in parentheses)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Independent Variables			
Reimbursement			
Change in medical reasonable charge	.028 (.039)	.097** (.044)	.123* (.065)
Physicians Characteristics			
Group	-.001 (.031)	.008 (.027)	-.023 (.049)
Experience	-.0004 (.0009)	.0009 (.0010)	.0022 (.0016)
Board cert	-.017 (.025)	-.035 (.025)	.050 (.042)
Osteopath	-.007 (.023)	.041 (.081)	-.204* (.111)
Foreign	-.018 (.062)	.120 (.086)	.048 (.103)
County Characteristics			
Urbanization:			
Large SMSA	-.017 (.028)	-.011 (.046)	.004 (.056)
Small SMSA or adjacent	-.011 (.032)	.004 (.054)	.046 (.069)
Semi-rural or rural	—	—	—
Change in MDs per 1,000	.122* (.072)	.629*** (.192)	.051 (.195)
Change in wage income (\$1,000)	.008 (.053)	-.083 (.076)	-.158* (.089)
Constant	-.076 (.083)	-.104 (.117)	.025 (.160)
R ²	.009	.083	.103
F	.46	3.45***	2.51***
N	506	390	231

*Significant at the 10% level.
 **Significant at the 5% level.
 ***Significant at the 1% level.

Finally, Table 12 shows the results for the regression of RVUs delivered per medical service on the same set of independent variables. The reimbursement variable and the regressions themselves are highly significant, each being significant at the 1 percent level for all three specialties. In general, the results show that there was a negative relationship between changes in reimbursement rates and the intensity of services delivered. That is, decreasing Medicare reimbursement tended to lead to increases in the intensity of services (that is, the average number of RVUs delivered per medical service) when other factors were held constant. It is useful once again to interpret these results by using the means provided in Table 8 to form elasticities. Doing this, we find that:

- For general practitioners, a 10 percent decrease in reasonable charges per medical RVU (at the mean) would lead to an 8.7 percent increase in the number of RVUs delivered per medical service. This equals about .4 RVUs, or about one-tenth of a "limited" follow-up visit.
- For internists, a 10 percent decrease in reasonable charge per medical RVU would lead to a 5.6 percent increase in the number of RVUs delivered per medical service. This equals about .3 RVUs, or about one-thirteenth of a "limited" follow-up office visit.
- For general surgeons, a 10 percent decrease in reasonable charges per medical RVU would lead to a 5.8 percent increase in the number of RVUs delivered per medical service. As in the case for internists, this equals about .3 RVUs or one-thirteenth of a "limited" follow-up visit.

Coefficients for some of the other independent variables were significant for certain specialties. For internists, more experienced physicians tended to increase service intensity faster than less experienced internists, and the few internists who were osteopaths decreased service intensity relative to non-osteopathic internists when faced with a decrease in reasonable charges. In addition, general surgeons in counties with larger increases in the wage income of health sector employees tended to raise service intensity more than other general surgeons.

TABLE 12
Regression Results of Change from 1976 to 1978 in
RVUs Delivered Per Medical Service
(standard errors in parentheses)

Variables	Specialty		
	General Practice	Internal Medicine	General Surgery
Independent Variables			
Reimbursement			
Change in medical reasonable charge	-2.03*** (.137)	-1.30*** (.212)	-1.50*** (.358)
Physician Characteristics			
Group	-.142 (.108)	.004 (.131)	-.142 (.273)
Experience	-.0038 (.0032)	.0081* (.0048)	-.0091 (.0089)
Board cert	.108 (.088)	-.062 (.120)	-.203 (.231)
Osteopath	.103 (.082)	-.953** (.391)	-.702 (.610)
Foreign	-.223 (.216)	.277 (.392)	-.677 (.568)
County Characteristics			
Urbanization:			
Large SMSA	-.014 (.097)	-.266 (.223)	.103 (.307)
Small SMSA or adjacent	.074 (.113)	-.352 (.261)	.479 (.377)
Semi-rural or rural	—	—	—
Change in MDs per 1,000	-.333 (.250)	-.206 (.933)	.141 (1.08)
Change in wage income (\$1,000)	-.261 (.186)	-.375 (.370)	.866* (.491)
Constant	1.20*** (2.90)	1.29** (.568)	-.414 (.876)
R ²	.318	.130	.123
F	23.1***	5.65***	3.11***
N	506	391	232

*Significant at the 10% level.
 **Significant at the 5% level.
 ***Significant at the 1% level.

The Overall Impact of the Change in Prevailing Charge Methodology on Physician Supply and Pricing Behavior

In the previous two sections we have estimated both the impact of changes in prevailing charges on changes in reasonable charges, and the impact of the latter variable on changes in physicians' output, pricing, and assignment behavior within the Medicare program. In this section, we combine these results to approximate the actual impact of the prevailing charge methodology change on physicians' economic decisions.

These final estimates should be viewed in light of three limitations: two involving data and one involving statistical inference. These limitations are:

- The actual changes in prevailing charges (Table 1) were calculated from a sample of 24 medical procedures rather than from each medical and surgical procedure reimbursed by Medicare.
- We do not know precisely what prevailing charges would have been in the absence of the change in policy, although this can be approximated.
- The regression results from the previous section implicitly assume that, per unit change in reasonable charge, physicians reacted equally to these changes independent of the size of the change. For example, by using these estimates, we assume that physicians whose reasonable charges increased twice as much as others exhibited changes in behavior, on average, that were twice as large. (This is a problem inherent in the use of ordinary least squares regression.)

With these caveats in mind, we may proceed with the estimates. First, it is necessary to estimate what prevailing charges would have been had the change in policy not taken place. We are primarily interested in what the change would have been between fiscal 1976 and 1977, the years when physicians faced different rates of change, rather than the 1977 to 1978 change, when all physicians experienced equal changes in prevailing charges.¹⁴ We have attempted to estimate what prevailing charges would have been in the absence of the change in policy by use of a proxy measure: the average change in prevailing charges among all Colorado physicians in each specialty. We would expect this figure to be reasonably accurate because the change in prevailing charge policy did not alter the way in which the charges were calculated, but only the method of aggregating physi-

¹⁴Had the change not taken place, it is likely that different areas of Colorado would have experienced different changes in prevailing charge levels. However, without information on the customary charges of physicians in each area, it is impossible to say in which areas physicians would have experienced larger increases.

cians. However, the method does implicitly assume that physicians in each region of the State would have had equal increases in prevailing charges between fiscal 1976 and 1977 had Colorado kept its area-wide prevailing charge methodology. Although we do not have sufficient information from which to make more realistic estimates, we used another technique to estimate the proxy and reached very similar results.¹⁵

For GPs, the average (mean) change in prevailing charges per RVU between fiscal 1976 and 1977 was 8.6 percent; for internists, it was 10.9 percent; and for general surgeons, it was 7.3 percent. By subtracting these figures from those in Table 1 in each area of the State, we can estimate the impact the change in prevailing charge policy had on prevailing charges in each. Then, by multiplying these changes by the regression results that showed the relationship between changes in prevailing and reasonable charges for each specialty, we obtain the estimated impact of the change on reasonable charge levels by area and specialty. These are presented in Table 13.

Finally, by using the results of the regressions of changes in physicians' economic behavior on changes in Medicare reasonable charges, we can estimate how the prevailing charge policy change affected physician pricing, medical assignment rates, and service intensity. As was done in the descriptive analysis, we combine physicians who experienced a relative increase into one grouping and those who experienced a relative decrease into another.¹⁶ Table 14

¹⁵Specifically, we took the change in the prevailing charges between 1977 and 1978 for each specialty and multiplied this by the inflation rate in medical case costs from 1976 to 1977.

¹⁶Within each grouping, the mean change in reasonable charges from Table 11 was calculated by weighting each area by the number of physicians in that area, separately by specialty.

TABLE 13

Percent Change from 1976 to 1977 in Reasonable Charges Per RVU Due To The Prevailing Charge Policy Change by Specialty and Area

Area Code	Geographic Area	Specialty		
		General Practice	Internal Medicine	General Surgery
1	Denver/Boulder	-2.7	-2.0	-1.3
2	North Central	3.7	6.6	1.0
3	Northwest	.2	2.5	2.0
4	West	5.5	11.6	3.2
5	Northeast	6.7	-2.0	-1.3
6	Colorado Springs	-2.7	.4	1.0
7	Central/South Central	5.7	1.3	.8
8	South Central	5.9	13.8	5.7
9	Southeast	11.4	-2.0	.3
10	Southwest	6.1	-2.0	1.3

shows the resulting impact of the prevailing charge policy change on submitted charges per RVU, submitted charges per surgical RVU, the assignment rate for medical services, and the average number of RVUs delivered per medical service, in comparison to what would have occurred had the change not taken place. (We do not present results for surgical assignment rates and the ratio of laboratory and radiology RVUs to medical RVUs because the regressions did not produce significant results.)

Among GPs, Table 14 shows that the prevailing charge policy change resulted in an increase of 3.8 percent for medical submitted charges, 4.6 percent for surgical submitted charges, and a 4.3 percent decrease in service intensity for physicians whose prevailing charges increased. For GPs whose prevailing charges declined, submitted charges per medical and surgical RVU were 2.1 percent and 2.5 percent lower than they would have been in the absence of the change, and service intensity was 2.3 percent higher. Assignment rate effects were not calculated for GPs, because, as indicated in Table 10, the regression results were not significant.

Internists who received a relative increase in prevailing charges increased medical and surgical prices, on average, by 3.5 percent and 5.4 percent, increased their assignment rates by 1.3 percent, and decreased service intensity by 3.0 percent. Internists who experienced the prevailing charge decreases had medical and surgical submitted charges 1.3 percent and 2.0 percent lower than if the changeover had not taken place, assignment rates for medical RVUs .5 percent lower, and delivered services 1.1 percent more intensive. General surgeons showed behavioral patterns similar to the other specialties, but less pronounced. Those who experienced relative increases in prevailing charges raised their medical and surgical prices by 2.0 percent and 1.4 percent more than they would have otherwise, their assignment rates by .5 percent more, and lowered service intensity by 1.4 percent more. General surgeons experiencing relative prevailing charge decreases had medical and surgical submitted charges 1.5 percent and 1.0 percent lower than they would have in lieu of the change, assignment rates .3 percent less than otherwise, and service intensity 0.8 percent greater than otherwise.

TABLE 14

**Percent Change from 1976 to 1978 in Physician Economic Behavior
Due to the Prevailing Charge Policy Change
by Specialty and Prevailing Charge Grouping**

	General Practice		Internal Medicine		General Surgery	
	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase	Relative Decrease	Relative Increase
Percent change in submitted charge per medical RVU	-2.1	3.8	-1.3	3.5	-1.5	2.0
Percent change in submitted charge per surgical RVU	-2.5	4.6	-2.0	5.4	-1.0	1.4
Change in Percent of medical RVUs assigned	-	-	-.5	1.3	-.3	.5
Percent change in RVUs delivered per medical service	2.3	-4.3	1.1	-3.0	0.8	-1.4

Discussion

The change in Medicare reimbursement methodology that resulted from the Colorado prevailing charge alteration provides a natural experiment from which to examine how physicians react to changing economic incentives. In addition, it allows us to examine the consequences of a policy change that is intuitively appealing—one that helped bridge the gap between Medicare program reimbursements for urban and non-urban physicians. The data base that was used to conduct this analysis was unusually rich, in that it contained actual (as opposed to reported) Medicare claims records as well as information on individual physicians. Because the claims information was available both before and after the change in prevailing charge policy, we have been able to estimate how physicians reacted to resulting change in their reimbursement rates.⁶

Our results indicate that physicians' submitted charges, assignment rates, and the average intensity of Medicare services provided were sensitive to changes in program reimbursements. Specifically, we found that among Colorado physicians between 1976 and 1978, there was a positive correlation between changes in program reimbursements and submitted charges for medical services and surgical services, as well as the assignment rate for medical services. We also found a negative correlation between changes in program reimbursement and in the average intensity of medical services billed; that is, relatively lower reimbursement rates tended to result in more intensive services billed by physicians. We did not find significant relationships between changing reimbursement rates and the provision of laboratory services and X-rays, however. Finally, we also found that increases in the number of physicians per 1,000 population were positively correlated with increased assignment rates among general practitioners and internists.

In general, our results are consistent with those found by researchers in other studies. Regarding submitted charges, Hadley and Lee (1978) also found that higher Medicare reimbursement rates tended to induce physicians to charge higher prices for their services. The Hadley and Lee study, however, reached this result by regressing submitted charges on reasonable charges directly; this could have led to a spurious positive correlation because under Medicare, a physician's reasonable charge in any given year is partly determined by his or her past submitted charges (Gabel, 1980). In our study, we avoided this problem by regressing differences in submitted charges on differences in reasonable charges, and reached results similar to those found in Hadley and Lee. As Gabel (1980b) has noted, these results imply that, "the more insurers pay, the higher physicians charge," and, as noted earlier, changes in Medicare prices may also imply corresponding changes in non-Medicare prices.

With regard to our finding that higher reimbursement rates tend to result in higher assignment rates (at least among internists and general surgeons), these findings appear to be consistent with those found by Paringer (1980) and Mitchell and Cromwell (1981) although our elasticities were somewhat lower than theirs. The Paringer study, like the present one, used Medicare claims data to formulate the assignment rate variables, while the Mitchell and Cromwell study relied on physician's self-reported data from a national physician survey. Thus, there seems to be ample evidence from very recent studies that assignment rates tend to rise with Medicare reimbursement rates, and tend to decline when Medicare reimburses physicians less.

To our knowledge, there have been no comparable studies of how the delivery of ancillary services and the intensity of services billed by physicians vary with changing Medicare reimbursement rates. Perhaps surprisingly, our study found no evidence that physicians reacted to these changes by providing more (or fewer) laboratory tests and X-rays. However, it should be noted that our results account only for cases in which the ordering physician bills the Medicare program, which appeared to be the case about one-fourth of the time for X-rays and about 70 percent of the time for laboratory tests. However, we did find a significant negative relationship between Medicare reimbursement rates and the intensity of medical services billed by physicians. It thus appears that physicians respond to lower reimbursement rates by billing for more intensive services. This implies that the flexibility physicians have in choosing the definition of service intensity they bill provides an easy opportunity for them to provide more intensive service or upgrade service definitions when they desire to recoup or increase revenues.

From a broader perspective, however, the results are intriguing because they reaffirm that physicians do respond to changes in the reimbursement rates of public medical care programs. The Colorado prevailing charge methodology change was quite technical—it altered the way in which one determinant of Medicare reimbursements (prevailing charges) was calculated. Nevertheless, physicians appear to have responded to this by altering prices, assignment rates, and service intensity. Given the fact that physicians do react to these economic factors, and considering the flexibility they are allowed in billing under the Medicare program, it is imperative that alternative reimbursement methods continue to be studied and developed so that the government may use its economic leverage to best encourage competitive physician behavior.

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