Special Article

THE EFFECT OF MEDICARE'S PAYMENT SYSTEM FOR REHABILITATION HOSPITALS ON LENGTH OF STAY, CHARGES, AND TOTAL PAYMENTS

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ABSTRACT

Background Medicare's system for the payment of rehabilitation hospitals is based on limits derived from a hospital's average allowable charges per patient discharged during a base year. Thereafter, payments are capped, but hospitals receive incentive payments if charges per patient are reduced in succeeding years. We hypothesized that per-patient charges would increase during the base year and then decrease in subsequent years. Hospitals would thus have higher reimbursement limits and receive incentive payments for reducing their charges.

Methods We analyzed Medicare claims data for 190,921 discharges from 69 rehabilitation hospitals from 1987 through 1994. We compared total charges, length of stay, and interim payments before, during, and after each hospital's base year.

Results After we controlled for inflation and temporal and seasonal trends, mean charges per patient discharged increased from $25,131 for patients discharged before the base year to $32,167 for patients discharged in the base year (a 28 percent increase, $P<0.001$) and the mean length of stay increased from 22.1 to 26.7 days (a 21 percent increase, $P<0.001$). After the base year, mean charges decreased to $29,307 (a 9 percent decrease) and the mean length of stay decreased to 24.0 days (a 10 percent decrease) ($P<0.001$ for both comparisons). Analysis of data on patients according to diagnosis — for example, spinal cord injury, brain injury, stroke, amputation or deformity, hip fracture, and arthritis or other joint disorders — showed similar findings for each, with increases in charges and length of stay in the base year, followed by small reductions thereafter. For-profit hospitals had greater increases than nonprofit hospitals in their per-patient charges (mean increase, $7,434 vs. $2,929; $P<0.001$) and length of stay (mean increase, 4.6 vs. 2.3 days, $P<0.001$) during the base year.

Conclusions Although Medicare's reimbursement system for rehabilitation hospitals put an upper limit on total payments, its design was associated with substantial extra costs, including significantly increased payments to hospitals and doctors and increased numbers of hospital days for the average patient. (N Engl J Med 1997;337:978-85.)

IN the past decade, the field of inpatient rehabilitation has grown dramatically. From 1986 through 1994, the number of Medicare-certified rehabilitation hospitals and units increased by 87 percent, from 545 to 1019.[1] In addition, between 1985 and 1989, the annual percentage of all patients discharged from rehabilitation hospitals whose care was paid for by Medicare increased from 39 to 65 percent,[2] suggesting that much of this growth has been fueled by payments from the Medicare program.

Although rates of hospitalization for acute care among Medicare beneficiaries decreased by 10 percent between 1986 and 1993, the annual rate of hospitalization for inpatient rehabilitation more than doubled, from 2.9 to 7.2 per 1000 beneficiaries.[1] Because of this growth, total annual Medicare payments to rehabilitation facilities have steadily increased, from $1.9 billion in 1990 to $3.7 billion in 1993.[1] As payments for inpatient rehabilitation have increased, scrutiny of Medicare's system for reimbursing rehabilitation facilities has also intensified, and this year Congress is attempting to reform the system.[3]

Unlike acute care hospitals, which are reimbursed prospectively on the basis of diagnosis-related groups (DRGs), all rehabilitation, psychiatric, long-term care, cancer, and children's hospitals are paid under regulations defined by the Tax Equity and Fiscal Responsibility Act of 1982 for care provided to Medicare patients.[4] This system regulates payments for inpatient hospital beds, nursing care, physical and occupational therapy, and other medical rehabilitation services.[4] Although much is known about the effects of the DRG-based payment system on acute care hospitals,[5-8] little is known about the effects of the Tax Equity and Fiscal Responsibility Act.[2,9-14]

Under the original act, all allowable charges were

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reimbursed, but payments to a given facility were capped at an annual maximum. This limit was different for each hospital and was based on the hospital's performance during a "base year." The base year was a designated 12-month period, usually 1 to 4 years after a facility began accepting Medicare patients. During the base year, all allowable Medicare charges were divided by the number of Medicare beneficiaries discharged to calculate a "discharge target amount," or the average amount paid for each Medicare patient during the base year. Thereafter, this figure was adjusted for inflation, and each year it was multiplied by the number of discharges of Medicare patients to calculate the hospital's payment cap.

If the cost of the care delivered by a hospital exceeded its annual payment cap, it might lose money. If a hospital was able to decrease its allowable charges per patient after its base year and did not reach its payment limit, then Medicare rewarded the hospital with an incentive payment. This payment equaled 50 percent of the difference between the hospital's total allowable charges for Medicare patients and its annual limit, but it was capped at 5 percent of the facility's maximal annual payment. Therefore, incentive payments increased until the average per-patient charge was decreased by 10 percent from that during the base year. Further reductions in per-patient charges did not lead to higher incentive payments (Fig. 1A).

Two important features created incentives under this payment system. First, hospitals knew in advance when their base year would begin, and second, up to and during the base year, allowable charges were reimbursed without limit. Thus, there was a clear economic incentive to increase charges during the base year and then decrease them by 10 percent thereafter. In this manner, a hospital could both achieve a higher overall reimbursement limit and maximize incentive payments (Fig. 1B).

We hypothesized that mean hospital charges per patient, the mean length of stay, and Medicare interim payments for rehabilitation hospitals would reflect the economic strategy of increasing charges during the base year and then decreasing them after the base year was over. In addition, we hypothesized that the case mix (defined according to the diagnosis and the patient's age) would vary so that patients with higher costs would be favored during the base year and patients with lower costs thereafter.

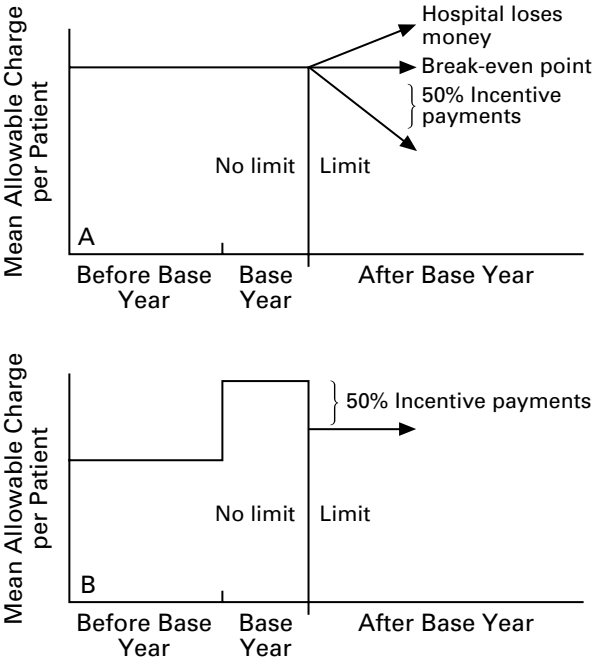


Figure 1. Possible Responses to Medicare's Payment System for Rehabilitation Hospitals.

Panel A represents the ideal response to Medicare's payment system; the incentive payments encourage a decrease in the mean allowable Medicare charges per patient after the base year. Panel B represents a strategic response to the system's incentives, with a large increase in mean allowable Medicare charges per patient during the base year, followed by a decrease once the limitation on reimbursement comes into effect.

METHODS

We used a retrospective cohort design and obtained data from Medicare billing records and selected hospital cost reports. Using Medicare's Online Survey, Certification, and Reporting System, we identified all 195 rehabilitation hospitals that were certified by Medicare as of March 31, 1995. We excluded rehabilitation units within acute care hospitals. Information about when each hospital's base year occurred was obtained from Medicare's fiscal intermediaries, such as Blue Cross–Blue Shield, and was confirmed with the data from hospital cost reports. Of the 195 rehabilitation hospitals, we selected 69 whose base years ended between January 1, 1988, and December 31, 1993. These dates were chosen to ensure consistency in billing data and to ensure that we had, at a minimum, records for the base year and the following year for each hospital. Of the 195 original hospitals, 60 were excluded because their base years ended before 1988, and 59 were excluded because their base years ended after 1993. Seven were excluded because of conflicting data about when the base year occurred. The final sample therefore comprised 69 hospitals.

We collected Medicare's Inpatient Standard Analytic File for all 191,104 discharges from the 69 study facilities between January 1, 1987, and December 31, 1994. All discharges for patients with multiple admissions were included. This file contained information on each patient's age, diagnosis at admission, coexisting illnesses, length of stay, and hospital charges, as well as interim Medicare payments and payments made by third-party payers, the patient, or both. We excluded 183 discharges because of conflicting data.

The remaining 190,921 discharges were grouped in 10 rehabilitation-specific diagnostic groups based on a model developed by the RAND Corporation.[12] These diagnostic categories encompassed 88 percent of all discharges. The remaining discharge diagnoses were classified as "other." To control for the effects of coexisting illnesses, we applied a modification of Charlson's comorbidity index to each patient.[15,16] All charges and payments were converted into 1994 dollars on the basis of the Consumer Price Index for Urban Hospitals.[17]

To determine the effects of the payment system on length of stay, total charges, and interim payments, we used a mixed-model analysis of covariance.[18] When appropriate, our models included terms for linear trend over time; season; the patient's age, comor-

TABLE 1. BASE-LINE CHARACTERISTICS OF THE STUDY HOSPITALS AND PATIENTS.*

CHARACTERISTIC	VALUE
Hospitals (n=69)	
Profit status — no. (%)	
For profit	56 (81)
Nonprofit	13 (19)
No. of beds — no. (%)	
<41	14 (20)
41–60	19 (28)
61–79	10 (14)
>79	26 (38)
No. of discharges per hospital	
Mean	2767
Range	424–5969
Patients	
Discharges (n=190,921) — no. (%)	
Before base year	36,242 (19)
During base year	24,166 (13)
After base year	130,513 (68)
Age — yr	75±10
Female sex — %	63.0
Mean length of stay — days	22.9±15.0
Charges per discharge — $	27,554±21,206
Interim payments per patient — $	16,417±12,434
Diagnosis — %	
Stroke	40
Hip fracture	14
Arthritis, other joint disorder, or joint replacement	13
Other	12
Back disorder	5
Cardiopulmonary disorder	4
Amputation or deformity	4
Other neurologic disorder	3
Spinal cord injury	3
Brain injury	3
Burns	<0.1

*Plus–minus values are means ±SD. Mean charges and interim payments have been adjusted for inflation and are expressed in 1994 dollars. The percentages of patients according to diagnosis do not total 100 because of rounding.

bidity score, and diagnosis; the profit status and size of the hospital; and two dummy variables indicating whether the discharge took place before, during, or after the base year. In addition, terms were used to assess the effects of the interaction of the hospital's profit status and the number of beds with other factors. Our models treated the individual hospitals as having a random effect, while all other covariates were treated as having fixed effects. To account for skewed distributions, we repeated the analysis after logarithmically transforming the variables for total charges, payments, and length of stay. Findings from the log-transformed models closely resembled those from models without transformation, so only the latter are shown.

To determine the effect of the payment system on the hospital case mix, the discharges were grouped first according to the diagnosis and then according to the patient's age, in four categories: less than 66 years, 66 to 75 years, 76 to 85 years, and more than 85 years. These groupings were then ranked according to the median payment per patient. A Mann–Whitney U test was then performed to determine whether there was a significant shift in the case mix toward higher- or lower-paying diagnoses or age groups from the period before the base year to the base year or from the base year to the period after the base year.[19]

To estimate the marginal increase in Medicare payments, we used data on interim payments. During a hospital's first year, Medicare calculated interim payments on the basis of the experience of similar hospitals in the area. If no such hospital existed, a budget was estimated and adjusted several times during that year. In subsequent years, the interim payments were based on the hospital's previous experience. At the end of every fiscal year, interim payments were reconciled with the hospital's final costs in a cost report.

We used unadjusted data on interim payments because we did not have access to all cost-report data during the study period. The Health Care Financing Administration did not keep centralized data concerning interim payments as compared with final payments. Such information was maintained by Medicare's fiscal intermediaries. Therefore, we could not adjust the interim payments for the final costs without obtaining original copies of each cost report submitted by the study hospitals. This was beyond the scope of our study.

Our analysis was performed with SAS (SAS Institute, Cary, N.C.) and SPSS (SPSS, Inc., Chicago) software. Two-tailed P values are presented, and values below 0.05 were considered to indicate statistical significance.

RESULTS

Base-Line Characteristics

The 69 study hospitals were located in 29 states. The base-line characteristics of these facilities and their patients are listed in Table 1.

Changes in Resource Use over Time

After we controlled for inflation and temporal and seasonal trends, the mean total charge per patient increased by $7,036 (28 percent) during the base year, as compared with the average before the base year ($P<0.001$), and the mean length of stay increased by 4.6 days (21 percent, $P<0.001$). After the base year, the mean total charges per patient decreased by $2,860 (9 percent, $P<0.001$) and the length of stay decreased by 2.7 days (10 percent, $P<0.001$) (Fig. 2).

Figure 3 shows the results of the diagnosis-specific models. These models controlled for inflation and temporal and seasonal trends, patients' age and coexisting illnesses, and hospitals' size and profit status. Findings were similar for all six diagnoses (spinal cord injury, brain injury, stroke, amputation or deformity, hip fracture, and arthritis or other joint disorders), with increases in the length of stay and the mean charge per patient during the base year, followed by small reductions thereafter. These six diagnostic groups accounted for over 75 percent of the discharges. The remaining 25 percent were grouped into the five additional categories; the findings for each (except for the 4 percent of patients with cardiopulmonary disorders) were similar (data not shown).

Analyses comparing nonprofit and for-profit hospitals showed that, after adjustment for inflation, temporal and seasonal trends, patient's age, diagnosis, coexisting illnesses, and size of the hospital, for-profit hospitals increased their mean charges per patient more from their average before the base year than did nonprofit hospitals (mean increase, $7,434 vs. $2,929; $P<0.001$). This resulted in higher overall mean charges per patient during the base year ($33,271 vs. $28,307, $P<0.006$) (Fig. 4A). The

mean length of stay during the base year also increased twice as much at for-profit hospitals as at nonprofit hospitals (mean increase, 4.6 days vs. 2.3 days; $P<0.001$).

When hospital size was analyzed, adding variables for the interaction of bed size with other factors significantly improved our model ($P<0.001$ by the likelihood-ratio test). We found that the larger the hospital, the more it charged during the base year. Mean charges per patient increased in all hospitals during the base year ($P<0.001$), but hospitals with fewer than 41 beds did not lower their charges after the base year was over (Fig. 4B).

Changes in Case Mix over Time

In assessing the changes in the case mix — as indicated by diagnostic groups — over time, we found that patients discharged in the period after the base year had a slightly higher probability than those discharged during the base year (0.53) of having lower-cost diagnoses ($P<0.001$ by the Mann–Whitney U test). The difference between the period before the base year and the base year was not significant ($P=0.46$). An analysis of changes in case mix according to patients' age did not show a significant difference over time.

Economic Impact of Medicare Payments

In assessing the economic impact of this payment system, we used the period before the base year at each hospital as a base line. We assumed that hospitals' behavior during this time period would be relatively inefficient, because they were, by definition, in their first years of operation and because they were not under any reimbursement limitation.

Using a modeling strategy identical to that used in our analysis of total charges, we examined interim payments and found, after controlling for inflation and temporal and seasonal trends, that hospital payments increased by $2,214 (9 percent) per patient from the period before the base year to the base year ($P<0.001$) and decreased by $2,113 (8 percent) after the base year was over ($P<0.001$). Medicare was responsible for 92 percent of these payments, with the remainder paid by patients and third-party payers. The marginal increase in interim hospital payments for the 24,166 patient discharges during the base year was $54 million. The marginal increase in interim payments for the 130,513 discharges after the base year was $101 ($2,214 – $2,113) per patient discharged, or approximately $13 million.

We estimated the marginal increase in incentive payments by first calculating Medicare's portion of the decrease in the average interim payment per discharge after the base year. This equaled 92 percent of $2,113, or $1,944. This amount was divided in half to determine the average incentive payment per discharge ($972). When this figure was multiplied by the 130,513 discharges for which such payments may have been made, the total was roughly $127 million. We estimated the total marginal increase in payments to the study hospitals from 1987 through 1994, including additional payments for the marginal increase in charges and incentive payments, at about $194 million.

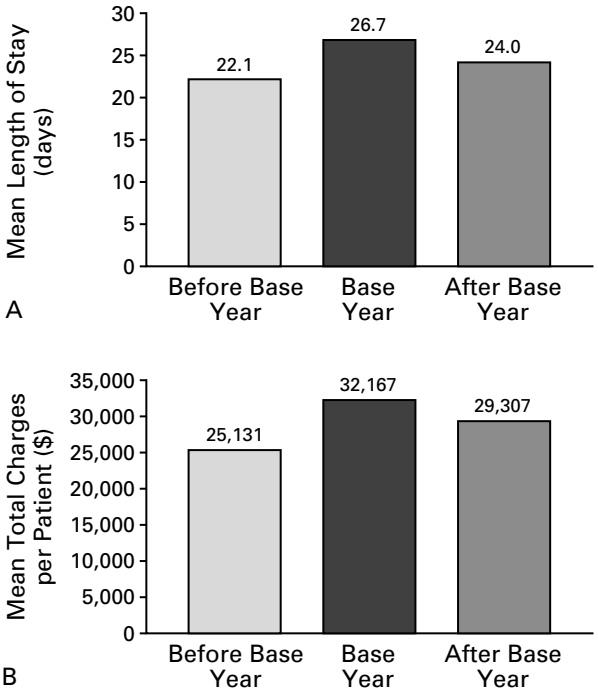


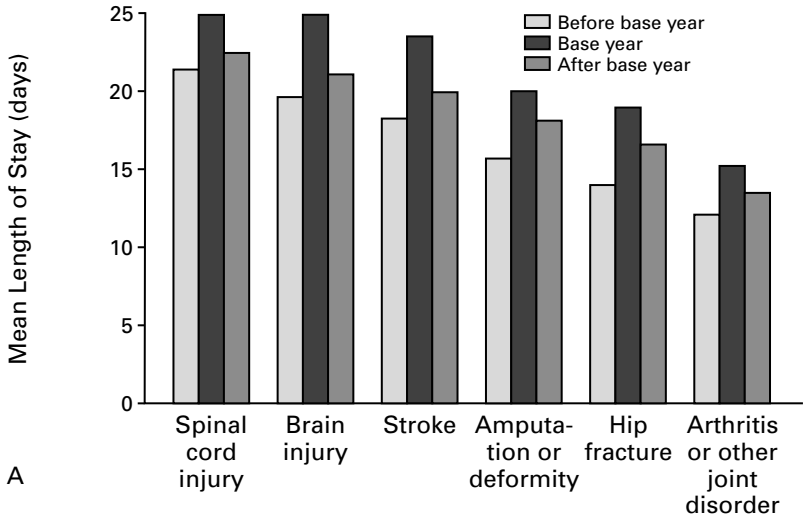
Figure 2. Changes over Time in the Mean Length of Stay (Panel A) and Mean Total Charges per Patient, with Adjustment for Inflation (Panel B), for All Patients.

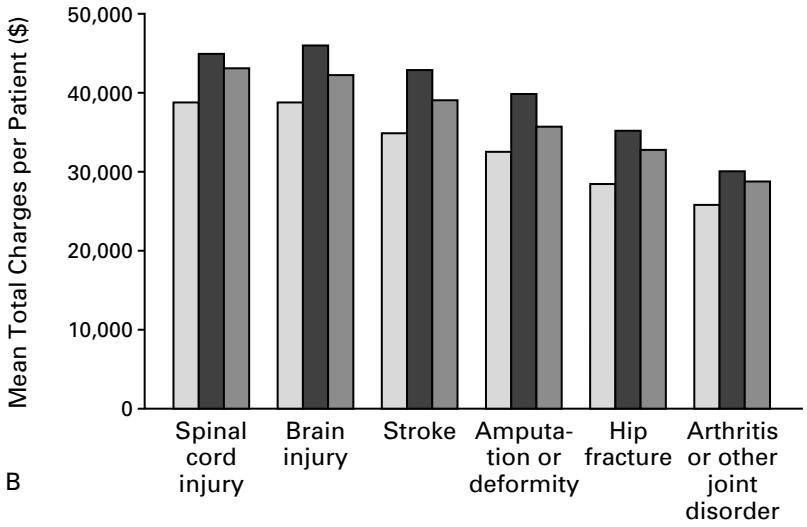
Changes have been adjusted for temporal and seasonal trends. Significant differences between the period before the base year and the base year, as well as between the base year and the period after the base year, were found for both length of stay and charges ($P<0.001$).

This figure is an underestimation of actual outlays, because it does not take into account increased reimbursement to physicians due to the longer mean hospital stay. If we again use the period before the base year as a base line and if we assume that physicians were reimbursed $45.41 for each additional day a patient spent in the hospital[20] (4.6 days for those discharged in the base year and 1.9 days for those discharged after the base year), then physicians in the study were reimbursed an additional $16 million, bringing the total marginal increase in payments to $210 million, or about $1,100 per discharge.

DISCUSSION

Our results support the hypothesis that Medicare's system of paying for inpatient care in rehabilitation hospitals encouraged an increase in charges and the

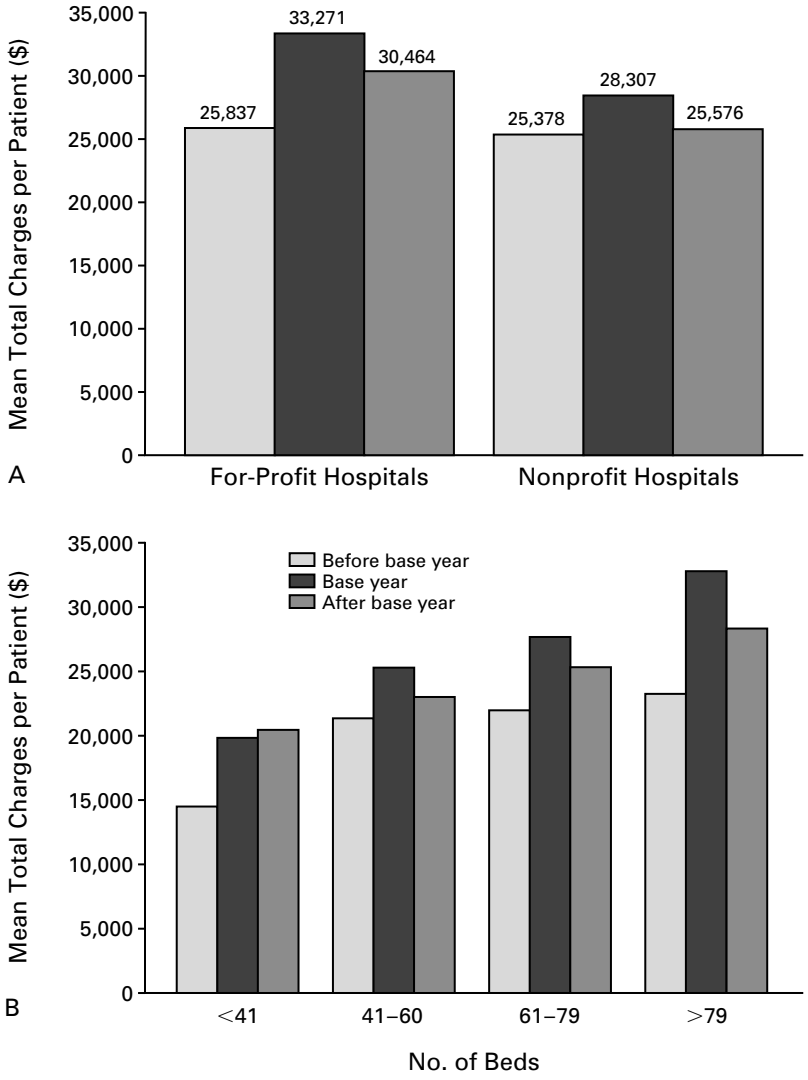




Diagnosis	Mean Charge per Patient ($)		
	Before base year	Base year	After base year
Spinal cord injury	38,761	44,973	43,148
Brain injury	38,660	46,249	42,056
Stroke	34,896	43,054	39,111
Amputation or deformity	32,636	40,202	35,949
Hip fracture	28,612	35,054	32,976
Arthritis or other joint disorder	25,977	30,299	29,198

Figure 3. Changes over Time in the Mean Length of Stay (Panel A) and Mean Total Charges per Patient, with Adjustment for Inflation (Panel B), According to Diagnosis.

We controlled for temporal and seasonal trends, the patients' ages and coexisting illnesses, and the hospitals' size and profit status. Differences between the period before the base year and the base year, as well as between the base year and the period after the base year, were statistically significant for both variables and for all diagnoses ($P<0.01$).



No. of Beds	Mean Charge per Patient ($)		
	Before base year	Base year	After base year
<41	14,500	19,985	20,347
41–60	21,250	25,249	23,173
61–79	21,872	27,855	25,359
>79	23,284	32,567	28,237

Figure 4. Changes over Time in the Mean Total Charges per Patient, with Adjustment for Inflation, According to Characteristics of the Hospital.

We controlled for temporal and seasonal trends; the patients' ages, diagnoses, and coexisting illnesses; and the size and profit status of the hospitals. The effects of the hospital characteristics were modeled with use of interaction terms. Panel A shows mean charges at 13 nonprofit hospitals and 56 for-profit hospitals. The for-profit hospitals had significantly higher overall charges in the base year ($P<0.006$) and greater increases from the period before the base year ($P<0.001$). Panel B shows the analysis for 14 hospitals with fewer than 41 beds, 19 with 41 to 60 beds, 10 with 61 to 79 beds, and 26 with more than 79 beds. The larger the hospital, the more its charges increased during the base year.

length of stay during the base year. As compared with the period before the base year, there was an increase of more than 20 percent in charges and the length of stay during the base year that was unrelated to seasonal variation or trends over time.

Our results also show that hospitals reduced their per-patient charges and patients' average length of stay by about 10 percent after the base year. However, this reduction represents only half the increase that occurred in the base year itself. Thus, the hospitals did not return to the efficiency level of the period before the base year, when there was no limitation on Medicare reimbursement for patient care.

From the hospitals' economic standpoint, this strategy is understandable. Reducing average charges by less than 10 percent after the base year would have resulted in smaller incentive payments, whereas reducing charges by more than 10 percent was not associated with additional monetary rewards and, in fact, might have yielded a lower overall reimbursement.[9]

It is important to remember that this payment system was retrospective. Because yearly reimbursement limits and incentive payments were not calculated until the end of the fiscal year, hospitals might not know whether they were over or under their annual limit until it was too late to alter their patterns of resource use. Therefore, advance planning was likely to be necessary.

The economic strategy we identified appeared to be implemented in two ways. First, most of the variation in charges was due to changes in the mean length of stay. That is, during the base year patients simply stayed in the hospital longer than patients with the same diagnosis in previous years. It does not appear that hospitals increased their charges per day, since charges and length of stay varied similarly over time. Second, there was a subtle but statistically significant change in the diagnostic case mix. Once the reimbursement limit was in effect, hospitals admitted proportionally fewer patients who were likely to have diagnoses with relatively high costs. This observation suggests that Medicare's payment system encouraged hospitals to favor patients in certain diagnostic categories, such as those with hip fractures or back disorders, in the period after the base year.

Our study has several limitations. First, we analyzed only 35 percent of the Medicare-certified rehabilitation hospitals that were certified as of March 1995. We did not analyze the effect of the payment system on the more than 800 rehabilitation units in acute care hospitals. These account for twice as much Medicare spending as free-standing rehabilitation hospitals.[1] Nor did we analyze other facilities, such as psychiatric and long-term care hospitals, that were paid by the same system.

Second, although the administrative data bases we used allowed us to examine and control for such characteristics of the patients as diagnosis, age, and coexisting illnesses, we were unable to analyze the severity of illness. The greater use of services during and after the base year might be accounted for by the treatment of more severely disabled patients, who required a greater intensity of services.

Third, our method of estimating the marginal increase in payments may have biased the results if interim payments systematically underestimated final costs before the base year and overestimated them during the base year. We believe this is unlikely, for two reasons. First, Medicare requires monitoring of interim payments; in aggregate, for all hospitals served by a particular fiscal intermediary, they can be no less than 96 percent and no more than 102 percent of the final costs submitted in cost reports.[21] In addition, the existence of such a bias is not supported by the rest of the data. If this bias existed, then we should have seen changes in the length of stay and in charges per patient that were smaller than those in interim payments. In fact, just the opposite occurred. Whereas interim payments increased by 9.1 percent in the base year and decreased by 8 percent thereafter, the length of stay increased by 21 percent and then decreased by 10 percent. Indeed, to the degree that the length of stay is a proxy for final payments, our use of interim payments may actually have led us to underestimate the marginal increase in costs.

There are also limits to the generalizability of our findings. We selected hospitals that opened after this payment system was instituted. A substantial number of hospitals were in operation before its enactment; their experience may have been different from that of the hospitals in our study.[10]

Finally, the hospitals we studied could be those at which the behavior we described was most prominent. Since we selected only existing hospitals, we may have missed facilities that did not opt for this economic strategy and subsequently failed. However, we did not exclude many failed rehabilitation hospitals. Of the 34 rehabilitation hospitals that were decertified during the study period, only 2 closed their doors. The rest were recertified as other types of hospitals, most commonly long-term care facilities.

The Balanced Budget Act of 1997, recently signed into law, requires changes in the system we studied, including reductions in incentive payments.[3] Although the essential structure of the system remains the same for most types of facilities, rehabilitation hospitals will move toward a prospective-payment system over the next few years. It remains to be seen whether these reforms will adequately address the problems we have highlighted.

In conclusion, we found that the economic incentives of Medicare's system of payment for rehabilitation hospitals encouraged a dramatic increase in per-

patient charges and length of stay during the base year. Incentives to reduce costs over subsequent years failed to encourage maximal efficiency. For-profit hospitals and larger facilities appeared to respond more strongly to these economic incentives than other hospitals. Although Medicare ultimately capped payments to rehabilitation hospitals, the design of the payment system was associated with substantial extra costs, including significantly increased Medicare payments to hospitals and doctors and significantly more patient days in the hospital.

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