

Assessing the FY 1989 change in Medicare PPS outlier policy

by Grace M. Carter and Donna O. Farley

In fiscal year (FY) 1989, Medicare changed its rules for paying for extremely long or expensive hospital stays called "outliers." We compared outlier payments in FYs 1989 and 1988, after adjusting for other simultaneous policy changes. We found that the new policy succeeded in targeting more outlier payments to the most expensive cases and to the hospitals suffering

larger prospective payment system (PPS) losses and in reducing hospital financial risk. Using time-series analyses, we show that the policy change had no measurable effect on the timing of discharges or on the concentration of expensive cases in urban government-owned hospitals.

Introduction

Under Medicare PPS, the price paid by the Health Care Financing Administration (HCFA) for a Medicare patient's hospital stay is proportional to the weight assigned to the diagnosis-related group (DRG) of the stay. The payment is intended to cover the cost of care for a typical patient in the DRG at an efficient hospital. Because costs of care vary for individual cases, hospitals are expected to make money on some patients and lose money on others so that, on average, payments equal costs. This system puts hospitals at financial risk; they will lose money if they are inefficient or if they are just unlucky and receive patients who require costlier care than average.

PPS also provides additional payments to outlier cases, which are cases that have extremely long lengths of stay or extremely high costs relative to typical cases in their DRG. The purposes of outlier payments are to reduce financial risk to hospitals and financial incentives to under serve extremely high-cost or long-staying patients. Financial risk arises from random factors—any hospital may receive more than its share of costly cases just by chance. In addition, some hospitals may consistently receive patients who are costlier than average for their DRG. Although other parts of PPS, including the continuous refinement of DRGs and special payments for special categories of hospitals (teaching, disproportionate share, sole community providers, and rural referral centers), are intended to address systematic differences across hospitals in costs, outlier payments may also help alleviate remaining differences between a hospital's expected payment per case and the cost of efficiently treating that group of cases.

HCFA implemented changes to its outlier policy effective November 1, 1989. In this article, we report our assessment of the effects of those changes. We compare the outlier policies in effect during FYs 1989 and 1988 with respect to the financial protection they afford to hospitals and the distribution of outlier

payments among high-cost cases, patient groups, and hospital groups; and we evaluate two aspects of the response of hospitals to outlier policy.

Outlier policy

There are two kinds of outliers: day outliers, which are cases that remain in the hospital longer than a day threshold, and cost outliers, which are cases whose charges exceed a cost threshold after adjustment to an estimate of cost. The values of the thresholds depend on DRG, but they are set so that only a small proportion of cases qualify for these outlier payments.

It was the original intent of policymakers that the amount of the outlier payment for a particular case approximate the marginal costs incurred after the case exceeds its threshold. This would provide an incentive to care appropriately for these unusual cases without providing an incentive to provide unnecessary care. The marginal costs are estimated as a fraction of total costs called "the marginal cost factor."¹

For cases that exceed the day outlier threshold, the day outlier payment formula is based on an approximation to the average Federal payment for a day in the same DRG at the same hospital. For each day beyond the outlier threshold, the formula adds to the DRG payment the marginal cost factor times the estimated daily Federal payment. The daily payment is an approximation because it is calculated by taking the case payment for the DRG and dividing it by the geometric mean length of stay (LOS) rather than dividing it by the arithmetic mean LOS.

The cost outlier payment formula uses ratios of cost to charges from the most recent settled cost report for each hospital. The charges for each potential cost outlier case are multiplied by these ratios and adjusted by payment factors to get an estimate of the standardized operating cost of the case. The cost outlier payment formula pays the marginal cost factor times the difference between the sum of these standardized costs for the case and the cost outlier threshold.

In the original implementation of the PPS, the marginal cost factor was set at 0.6. When a case exceeded both the day and the cost outlier thresholds, it was paid at the day outlier rate.

This research was supported by Cooperative Agreement 99-C98489/9-07 between the Health Care Financing Administration and the RAND/UCLA/Harvard Center for Policy Research in Health Care Financing and by the Pew Memorial Trust through a fellowship to Donna O. Farley.

Reprint requests: Grace M. Carter, RAND, 1700 Main Street, P.O. Box 2138, Santa Monica, California 90407-2138.

¹Since FY 1992, outlier payments are also made for the Federal portion of capital costs. We ignore this complication because our study data come from the period preceding this decision.

The way outlier payments are calculated was changed for discharges occurring on or after November 1, 1988, with the intent to reduce hospitals' financial risk by increasing payment for the most costly cases. The changes were:

- Cases that exceed both day and cost outlier thresholds now receive payment according to whichever formula provides the greater payment amount.
- The marginal factor for cost outliers, excluding burn cases, was changed from 0.60 to 0.75. (The marginal cost factor for both day and cost outliers in burn DRGs was set at 0.9 on April 1, 1988).²
- A hospital-specific cost-to-charge ratio is now used to standardize charges to an estimate of costs when calculating the cost outlier formula. Previously, a single number, 0.66, was used as an estimate of the cost-to-charge ratio for all hospitals.

Congress has legislated that outlier thresholds be set so that outlier payments will account for between 5 and 6 percent of estimated PPS payments. Because the new outlier policy yields higher payments to individual outlier cases, to maintain the legislated payment levels, it was necessary to reduce the number of outlier cases by increasing outlier thresholds. The day outlier threshold was set at the geometric mean LOS for the DRG plus the lesser of 24 days or 3 standard deviations. The cost outlier threshold was set at the greater of twice the Federal payment rate for the DRG or \$28,000.

Background

The 1989 change in outlier policy was based in part on RAND research that showed that: (1) hospital financial risk is indeed a substantial problem, (2) cost outlier payments were an effective means of insuring hospitals against the financial risk inherent in PPS, and (3) day outlier payments provide much less insurance than cost outlier payments (Keeler, Carter, and Trude, 1988.) Research by the Congressional Research Service (1987) also pointed out that the use of LOS as the primary criterion for an outlier case does not meet standards of efficiency and effectiveness.

Another problem with the original outlier policy was pointed out by both RAND and the Congressional Research Service—the existence of a discontinuity or “notch” in payment. Cases that exceeded both the day outlier threshold and the cost outlier threshold were paid the day outlier supplement. This gave hospitals an undesirable incentive related to the relatively small number of cases that are cost outliers and then cross the day outlier threshold. On the day that the case crossed the day outlier threshold, the hospital lost a substantial amount of money (the cost outlier payment minus a single day's per diem), and thus there was an incentive to discharge the patient before this would happen. This incentive was removed in FY 1989 by the provision that

pays cases that exceed both thresholds the maximum of the amount from the day formula or the cost formula.

In a study for the Prospective Payment Assessment Commission (ProPAC), the cost of services delivered during outlier days was estimated using data for a convenience sample of 104 hospitals that were roughly representative of large urban hospitals (Carter and Melnick, 1990). The study showed that the payment amount for day outliers under the FY 1989 rule was more generous relative to costs beyond the threshold than the payment amount for cost outliers. In many cases, most frequently in surgical DRGs, a hospital would recover more than its costs by keeping a day outlier patient in the hospital for a longer period.³

Patient selection was investigated by Newhouse (1989) as a possible hospital response to the fixed DRG payments under the new PPS. He used three tests to measure shifting of expensive patients to hospitals of last resort: (1) the likelihood of a transfer to another hospital, (2) the share of cases in unprofitable DRGs, and (3) the share of outlier cases in each group of hospitals.

Newhouse (1989) limited his study to hospitals in metropolitan statistical areas with more than 1 million residents because the greater concentration of hospitals in such areas provides opportunity for shifting of patients that may not exist in less urbanized areas. If shifting of patients was occurring, most likely it would be observed in these locations. He defined hospitals of last resort as city and county hospitals, comparing measures for this group of hospitals with all other hospitals in large areas. His findings were ambiguous, with two of the three measures not providing evidence of patient shifting behaviors; only changes in percents of cases in unprofitable DRGs suggested patient selection. It may have been too early to detect a pattern of changing behavior, given that the study was performed using data from early years under PPS. Newhouse (1989) suggested that the question be revisited later.

Data and methodology

Data

We used a 20-percent sample of PPS hospitalizations in short-term hospitals from the Medicare provider analysis and review (MEDPAR) files. We compared data on FY 1989 discharges with those on FY 1988 discharges, excluding cases in hospitals for which neither a PPS4 nor a PPS5 cost report was available and cases with zero charges or with an invalid DRG. Because of difficulties in estimating costs, we also excluded hospitalizations in “all-inclusive” providers. We also analyzed trends in hospital behavior using data for the period January 1986 through the end of FY 1989, excluding only cases with zero charges and those with an invalid DRG.

²The marginal cost factor for day outliers in burn DRGs returned to 0.6, starting with discharges occurring on October 1, 1989; the marginal cost factor for cost outliers remains at 0.9 in burn DRGs.

³The study used the standard cost-accounting methodology to estimate hospital costs and, therefore, did not account for nursing intensity differentials beyond those associated with the difference between routine care and special care units.

We estimated the operating cost of each FY 1988 and FY 1989 MEDPAR case, using the Medicare cost reports for PPS years 4 and 5. For FY 1988 discharges, we used the Medicare cost report corresponding to the day of discharge, whenever it was available. We used the PPS5 cost reports to estimate the costs of all FY 1989 cases, many of which occurred during PPS6. The PPS5 cost reports were unaudited and thus probably slightly overestimate costs.

For information about hospital characteristics, we used a file provided by HCFA that contained the most up-to-date hospital data available centrally in the fall of 1990.

Methods

We compared payments in FYs 1988 and 1989, excluding those in October of each year because the FY 1989 policy began November 1. There were a total of 1,632,244 cases in our FY 1988 analysis file and 1,650,772 cases in our FY 1989 analysis file. We analyzed both actual payments and payments adjusted to control for two changes in non-outlier policy: (1) the completion of the transition from a blend of hospital-specific and Federal payment rates to a single rate and (2) the effect of the Medicare Catastrophic Care Act.⁴ Details will be given later.

We also simulated both the FY 1988 outlier policy and the FY 1989 outlier policy on the FY 1989 cases. We compared these two runs to see whether our conclusions about the effect of the policy change were affected by other differences in the data sets.⁵ We do not report these simulations in detail; rather we report results only when they differ from our comparisons of the adjusted FYs 1988 and 1989 data.

We examined whether hospital behavior appears to be affected by the details of outlier policy or by changes to it. We examined whether hospitals had responded to the notch in payment by discharging a large number of cases immediately before the day outlier threshold.

In a second analysis, we examined whether trends in the concentration of very expensive cases and of transfer cases in hospitals of last resort suggested that hospitals responded to the outlier policy change. Our approach was similar to that of Newhouse (1989). We limited our analysis to hospitals in large urban areas. We defined government-owned hospitals as hospitals of last resort and compared measures for these hospitals with all other hospitals in large urban areas.

We used a time-series analysis based on quarterly data beginning with January 1986 and continuing through the end of FY 1989, thus having 15 data points. For each quarter, we calculated the logit transform of the fraction of cases that were expensive out of all those

at government-owned hospitals in large urban areas. We then used the ordinary least squares analysis to test for the existence of a trend and added a dummy variable for FY 1989 to test for a deviation from that trend. The analysis was repeated for other hospitals in large urban areas and for transfer cases in each type of hospital.

Adjustment of FY 1988 cases

During the part of FY 1988 that was contained in the hospital's fiscal year that began in FY 1987 and during the first 51 days of the hospital's fiscal year that began in FY 1988, each hospital's prospective payment rate consisted of 75 percent of the Federal rate and 25 percent of the hospital-specific rate. Because outlier payments are made only on the Federal portion of the rate, outlier payments were only 75 percent as large in the early part of FY 1988 as they were during FY 1989. Thus, we report adjusted FY 1988 outlier payments for which we multiplied the amount of the outlier payment by $1\frac{1}{3}$ for discharges that occurred prior to 51 days into the hospital's fiscal year.

This adjustment resulted in a 13.5-percent increase in average outlier payments.⁶ The basic DRG payment rate was multiplied by a factor in order to create comparability of total payments and risk. Separate correction factors were used for rural, other urban, and large urban hospitals. Although the corrections were not exact, total payment in the adjusted file was within 0.15 percent of actual 1988 payments.

Adjustment of FY 1989 cases

The Medicare Catastrophic Care Act (MCCA), which removed the limit on the number of days of hospital care that are covered by Medicare, was in force for calendar year 1989 and then repealed. Both before and after calendar year 1989, Medicare covered only 90 days of care in a single benefit period, with the beneficiary having the option of increasing coverage by using a once-in-a-lifetime reserve pool of 60 days.⁷ Day outlier payments are made only for covered days, and cost outlier payments are made only for covered charges. Thus, the MCCA increased outlier payments compared with current laws.⁸ In addition, the patients who are not entitled to complete coverage of their hospital stay are not a random selection of patients; they are either undergoing an exceptionally long stay or have been hospitalized very recently and in either case are probably unusually expensive patients. They also may not be randomly distributed across hospital groups.

⁶This and other statistics concerning our comparison of FYs 1988 and 1989 refer to the period studied here and therefore exclude October discharges.

⁷A benefit period ends when the beneficiary has been out of the hospital, skilled nursing facility, or rehabilitation hospital for at least 60 days. The beneficiary must pay a coinsurance amount for days 61 through 90 and also for lifetime reserve days.

⁸Analysis of actual payments suggests that the MCCA increased outlier payments to 5.5 percent of PPS payments from 5.1 percent (*Federal Register*, 1990). Earlier analyses had suggested a much larger effect, with outlier payments reaching 6.2 percent of PPS payments (*Federal Register*, 1988).

⁴We did not adjust for the regulations introduced on April 1, 1988. Because these changes increased outlier payments only from 5.0 percent of PPS of PPS payments to 5.1 percent of payments (*Federal Register*, 1988), we decided they would have an insignificant effect on our analysis.

⁵The simulation of the FY 1989 policy on the FY 1989 cases also served as a check on the accuracy of the MEDPAR data on payment and outlier payments that seemed to be fine except in a small number of cases.

We adjusted actual FY 1989 outlier payments for each case to an estimate of what outlier payments would have been under current coverage rules. The adjustments were based on estimates of the number of days and the amount of charges that would be covered under current rules. The algorithm assumed that lifetime reserve days available on January 1, 1989, were 60 minus the number used from January 1, 1986, through December 31, 1988. Then, the number of covered days was estimated by applying the coverage rules to each beneficiary's history of hospitalizations, starting with April 1, 1988, and assuming that any beneficiary that had lifetime reserve days available would choose to use them whenever possible. We ignored the effect of skilled nursing facility stays on the length of the spell of illness. This means that we treat some uncovered days as covered, but all the days we treat as uncovered are in fact uncovered.

We found that FY 1988 data were consistent with uncovered charges being directly proportional to the number of uncovered days in the stay. Consequently, we calculated average uncovered charges for each uncovered day and inflated it by the rate of increase in average daily charges from FY 1988 to FY 1989 (14 percent), obtaining an estimated decline of \$300 in covered charges for each uncovered day.

Finally, we adjusted outlier payments to estimate the amount that would have been received under the FY 1989 outlier rules and current coverage rules. For each case, we simulated outlier payments using covered days and costs from the file and again using our adjusted covered costs and covered days. The actual outlier payment for each case was then reduced to reflect current coverage rules in the same proportion as the simulated payment for the case was reduced to reflect current coverage rules. The simulated payments did not always match the actual payments because, in some cases, we did not have the same payment rates for indirect medical education costs or disproportionate share that the intermediary used to calculate payments. In addition, we removed cases from tabulations of adjusted FY 1989 cases where we estimated that the patient would have had no coverage under current laws. We did not correct the FY 1989 payment rate to maintain budget neutrality because the MCCA was intended to increase Medicare's share of hospital payments, and its repeal returned payment to the status quo ante.

The effect of the adjustments was a reduction of 1,278 cases from our analysis file (including 113 outlier cases) and a reduction in outlier payments for an additional 857 outlier cases. The adjustment affects only 2.4 percent of outlier cases; and, therefore, it has only a modest effect on most of our analyses. It does, however, affect the percent of outlier payments that go to the most costly cases and the frequency with which day outlier payments transform outlier cases into profitable cases.

Variable definitions

We estimate the cost of each case using the method of Newhouse, Cretin, and Witsberger (1989). Briefly, cost

report data are used to generate ratios of costs to charges⁹ for each of 12 ancillary departments and to estimate the per diem cost of routine care and the per diem cost of care in a special care setting such as an intensive care unit or a coronary care unit.

To estimate ancillary costs for a particular case, ancillary charges for the case in each of 12 departments are multiplied by the appropriate cost-to-charge ratio and then summed. Per diem costs are calculated as the number of days spent in routine care times the routine care per diem plus the number of days spent in special care units times the special care per diem. Before calculating per diem cost, routine care and special care per diems were inflated (or deflated) according to the number of months from the center of the hospital's fiscal year until the month of admission. The total cost of the case is the sum of ancillary costs and per diem costs.

This method is not without problems. One of the problems is that the cost of high-cost cases may be biased downwards because of cost-shifting behavior within each hospital. Another problem is that it uses just a single per diem for routine nursing costs and another for special-care costs, and yet nursing costs may vary by patient. Despite its problems, this method is likely the best available way to estimate case-specific costs on a nationally representative sample.

We need an estimate of whether each case was paid under the day outlier formula or the cost outlier formula. For FY 1988 we used the type of outlier code from the MEDPAR file. For FY 1989, the MEDPAR classified all cases that exceeded the day outlier threshold as day outliers even if they were paid using the cost outlier formula. So, we simulated payment amounts due under the day formula and cost formula and classified each outlier case according to whichever produced the larger payment.

The amount of the outlier payment is taken directly from the MEDPAR file and excludes the related payment for indirect medical education and disproportionate share. We calculated payment per case as the sum of the DRG price, the outlier payment, and the indirect medical education amount. This omits disproportionate share payments, which are not included on the MEDPAR file. We also simulated payments (including disproportionate share payments) and mentioned below places where the simulated results differed substantially from the MEDPAR data.

Profit is payment minus cost. Note that because cost is based on total charges and payment covers only covered charges, profit omits payment by the beneficiary for uncovered charges. We made this unusual choice in order to maintain the greatest possible comparability between FYs 1988 and 1989 data on this key variable. In FY 1988, non-covered charges represented about 1.7 percent of total charges, but it was only 1.4 percent of charges in our adjusted data for FY 1989. This difference probably reflects only limitations of our adjustment methodology. By using

⁹The ratios exclude the direct costs of medical education and capital costs.

Table 1
Actual and adjusted payments: Fiscal years 1988 and 1989

Statistics	Actual payments		Adjusted payments	
	1988	1989	1988	1989
Percent of outlier cases	4.79	2.47	4.79	2.46
Average outlier payment per outlier	\$4,466	\$10,689	\$5,066	\$10,405
Average outlier payment per case	214	264	243	256
Average payment per case	4,439	4,662	4,446	4,653
Average cost per case	4,360	4,914	4,360	4,912
Average profit per case	58	- 252	66	- 259

SOURCE: (Carter and Farley, 1992).

total charges in each year, we reduce the effect of errors in our estimate of the adjustment for covered days and covered charges, and the effect of the change in policy can be seen more clearly.¹⁰ If we had defined profit as payment minus estimated covered cost as in our previous work, the average profit on FY 1988 cases would have increased by \$128.

In order to describe the effect of each year's outlier payments on the financial risk faced by all hospitals and groups of hospitals, we used the methodology developed by Keeler, Carter, and Trude (1988). The measure of risk is defined as the standard deviation of annual profit expressed as a percent of annual revenues at the hospital. It is estimated by assuming that each case is drawn at random from a hospital-specific distribution of profit.

In order to examine the concentration of expensive cases in hospitals of last resort, we defined two groups of expensive cases: those whose costs exceed the average for their DRG by a dollar amount that ranked in the largest 5 percent (or 15 percent) of all such deviations across all DRGs. Further details can be found in the Technical note.

Transfer cases were defined as cases that were admitted on the same day that they were discharged from a different short-stay hospital.

Outcomes of the policy change

In this section we compare payments under the FY 1989 policy with those under the previous policy and estimate the effect of these payments on hospitals' financial risk. We report adjusted payments in FYs 1988 and 1989, excluding those in October of each year because the FY 1989 policy began November 1. A limited amount of summary information is presented about both actual and adjusted payments.

Summary statistics

Table 1 provides summary statistics that describe payments and our adjustments. The first two columns describe actual payments in FYs 1988 and 1989. The 1988 adjusted column shows the payments that would have occurred if outlier payments were based on

¹⁰Errors in our estimate of covered days and covered charges still will affect payment for outlier cases, but only 28 percent of the cases for which we estimate an effect of the MCCA on covered days and charges were outlier cases.

100 percent of the payment rather than just on the Federal portion. The 1989 adjusted column shows what we estimated would have occurred in 1989 if the MCCA had not been in effect. We believe the adjusted data are more informative about the effect of the outlier policy than the unadjusted data.

As intended by HCFA, the proportion of cases paid as outliers declined by almost 50 percent between FYs 1988 and 1989. The average outlier payment per outlier increased by 139 percent. Although part of this increase was the result of the transition to all Federal payment rates and to the MCCA, the average outlier payment per outlier increased by 105 percent in the adjusted data. The combined decline in outlier cases and increase in payment per outlier cases almost canceled each other out with the adjusted FY 1989 outlier payment per case only 5.3 percent higher than the adjusted FY 1988 payment.

Profit per case declined between FYs 1988 and 1989 as costs per case increased more rapidly than the DRG payment rate. The decline in profit was not in any large part the result of the outlier payment change. The FY 1989 outlier rules resulted in virtually the same percent of adjusted payment coming from outlier payments (5.52 percent) as did the FY 1988 outlier rules (5.49 percent).

The FY 1989 thresholds also accomplished the goal of increasing the proportion of outlier payments whose amount is fixed via the cost formula. Table 2 shows that the type of outlier payments that occurred in 1989 corresponded approximately to the plan. Forty-five percent of 1989 outlier payments were determined by the cost formula. In FY 1988, when any outlier that met both day and cost thresholds received the day outlier payment, cost outliers were only 27 percent of outlier cases and received only 19 percent of outlier payments.

Case-level payments and costs

One of the primary purposes of the new outlier payment policy was to increase outlier payments to the costliest cases. In order to look at the extent to which this goal was achieved, we define the relative costliness of a case as the difference between the cost of the case and the basic DRG payment for the case (i.e. the DRG weight times the Federal payment rate adjusted for wages, cost-of-living adjustment, teaching, and disproportionate share). Table 3 shows that the cases that lost more than \$50,000 before outlier payments had their average adjusted outlier payment roughly double

Table 2

Comparison of planned outlier payments with actual payments, by type of outlier: Fiscal year 1989

Type of outlier case	Percent of outlier cases		Percent of outlier payments	
	Planned	Actual	Planned	Actual
Total	100.0	100.0	100.0	100.0
Meets day threshold only	57.0	58.2	27.4	29.7
Meets both, paid by day formula	10.6	12.1	18.4	24.2
Meets both, paid by cost formula	15.0	13.8	39.6	33.6
Meets cost threshold only	17.4	16.0	14.6	12.6

SOURCES: Planned data (*Federal Register*, 1988); actual data (Carter and Farley, 1992).

Table 3

Average adjusted outlier payments, by pre- and post-outlier loss per case: Fiscal years 1988 and 1989

Loss per case in \$1,000	Pre-outlier loss per case				Post-outlier loss per case			
	Number of cases		Average outlier payment per case		Number of cases		Average outlier payment per case	
	1988	1989	1988	1989	1988	1989	1988	1989
≥ 150	70	119	\$50,568	\$94,065	20	14	\$31,001	\$16,879
100 to 149	230	430	37,215	66,783	80	53	31,014	16,986
50 to 99	1,897	2,834	21,713	35,584	892	460	17,827	24,682
40 to 49	1,348	1,989	15,863	21,511	730	502	13,719	21,006
30 to 39	2,696	4,026	12,273	14,124	1,330	1,351	9,839	15,739
20 to 29	7,337	10,506	8,505	7,266	3,703	6,237	6,679	8,759
10 to 19	32,113	41,864	4,043	1,814	19,518	39,673	3,263	2,810
0 to 9	1,010,985	1,046,835	88	23	1,024,165	1,056,899	171	110
- 10 to - 1	563,919	534,999	7	4	569,170	537,301	105	84
- 20 to - 11	5,523	5,111	203	142	6,163	5,648	2,537	3,082
< - 20	909	804	1,303	3,162	1,256	1,379	11,727	24,110

SOURCE: (Carter and Farley, 1992).

between FYs 1988 and 1989. The cases that lost more than \$30,000 before outlier payments had higher adjusted outlier payments in FY 1989 than in FY 1988. The large outlier payments shown for the small number of cases with a pre-outlier profit of more than \$20,000 is likely spurious. When we simulated payments, we obtained substantially smaller average outlier payments for this group of cases.

The right-hand section of Table 3 also shows the distribution of cases and the amount of outlier payments per case by the loss for the case after including outlier payments. In both FYs, outlier payments greatly reduced the number of cases with large losses, but the 1989 policy reduced the proportion of cases with large losses more than the 1988 policy did.

A related question concerns the appropriateness of the size of the outlier payment. Outlier payments are intended to mitigate the loss on outlier cases, not to make them profitable. In both years, however, roughly 20 percent of outlier payments went to cases that turned out to be profitable.¹¹ Although the new policy identified much less costly cases as day outliers, the formula for computing the payment remained the same. Thus as shown in Table 4, some day outlier payments went to profitable cases in both years, but the fraction was higher in FY 1989. In FY 1989, 29 percent of day

outlier payments went to profitable cases; 14 percent went to cases that earned more than \$10,000 profit.¹²

The relationship between profitability and LOS was consistent with outlier payments being higher than the cost of the services delivered on an outlier day as may be seen in Table 5. Only 2.7 percent of cases paid by the day outlier formula that exceed the threshold by 10 days or less are profitable. The percent of cases that are profitable rises strongly with the number of outlier days, reaching 41.8 percent for the cases with the largest number of outlier days. The percent of profitable cases also increases with DRG weight for each category of number of days. This might be, in part, the result of a correlation between the amount by which the per diem outlier payment exceeds incremental costs and DRG weight.

Although 81 percent of the profitable outlier cases are paid using the day outlier formula, a small number of cost outlier cases also turn out to be profitable. There are several reasons for profitable cost outliers. First, the policy change toward paying a higher percent of outlier payments using cost outlier payments implied a shift of outlier funds towards surgical cases. Insofar as surgical cases are more likely than medical cases to cause a large loss, this shift corresponds to policy intent. However, as Price (1989) showed, surgical cases have a lower ratio of cost to charge (RCC) than medical cases when cost is

¹¹See the increase in number of profitable cases and large outlier payment per case in Table 3.

¹²These numbers are not much affected by the data problems previously mentioned and are consistent with numbers from simulated payments.

Table 4

Cumulative distribution of outlier payments, by amount of profit and type of outlier payment: Fiscal years 1988 and 1989

Profit in dollars	Cumulative distribution ¹			
	1989		1988	
	Paid day	Paid cost	Paid day	Paid cost
10,000	14	6	3	8
0	29	11	13	23
-10,000	66	27	77	67
-20,000	86	60	96	83
-30,000	94	80	98	89
-40,000	96	89	99	93
-50,000	97	93	99	95

¹Percent of outlier payments to cases earning at least this much.

SOURCE: (Carter and Farley, 1992).

estimated using the usual departmental methodology. Because the cost outlier formula uses the same hospital-specific RCC for all cases, it overestimates costs of surgical cases relative to medical cases. We found that costs estimated using the hospital-specific ratio were 10.6 percent higher than those using departmental ratios for surgical cases but were only 4.4 percent higher for medical cases.

A second reason for profitable cost outliers is that RCCs vary by year, and the RCC may be several years out of date. In our data, the ratio of average cost per case to cost estimated as $RCC \times \text{total charges}$ to cost per case estimated from the departmental methodology is 1.07. Eight percent of the profitable outliers had RCCs calculated within the sample that were less than 0.75 of the payment RCC for the hospital.

Third, many of the cost reports used with the departmental methodology were not yet audited and may contain substantial errors. A final but more infrequent reason is that cost payments in DRG 302 appear to be based on covered charges including kidney acquisition charges. These cases are thus receiving double payments for these costs—once at cost and once at 75 percent of cost. We estimate that an average of \$4,123 of their outlier payments were the result of double payment. This is small in terms of the Medicare budget and amounts to about \$3 million annually after adjustment for our 20 percent sample.

Hospital profitability

We ask here whether the FY 1989 payment policy provided extra compensation to hospitals with a costly case mix. We characterize each hospital by its per case pre-outlier loss in FY 1989 based on the adjusted data. It is this loss that outlier payments can mitigate. We chose the FY 1989 characterization because we believed it most closely reflects future DRG payments.

Table 6 provides data on adjusted outlier payments to each hospital category. The 177 hospitals with the costliest cases received outlier payments for a higher percent of cases in FY 1989 than in FY 1988 (12.8 versus 7.0) and received substantially higher average outlier payments per case (\$1,287 versus \$463). This 3.4 percent of hospitals with 1.3 percent of cases received 7.2 percent of adjusted FY 1989 outlier payments. Each category of hospital that lost more than an average of \$1,000 per case gained from the FY 1989 policy change; all others lost.

Hospital risk

Another goal of the change in outlier payments was to reduce the financial risk that hospitals face from obtaining, just by chance, a costlier than expected patient mix. Here we examine whether this goal has been achieved. The average hospital-weighted value of risk was 3.18 in both FYs 1988 and 1989. The average computed after weighting each hospital by the number of Medicare cases was also roughly similar in both years: 1.77 in FY 1988 and 1.81 in FY 1989. Hospital-weighted risk is substantially higher than case-weighted risk because small hospitals tend to have much higher risk because they get less benefit from the law of large numbers. Under the assumptions of the risk model, a hospital's profit in any one year has the normal distribution with standard deviation equal to risk multiplied by annual revenue. Therefore, using a normal distribution table, one can calculate that a hospital with the typical risk value of 3.20 will see its profit be more than 3.20 percent of revenue lower than expected in 15.9 percent of its operating years. For 1,000 such hospitals, 159 would experience losses in excess of 3.20 percent of revenue just from chance; 23 would experience losses in excess of 6.6 percent of revenue just from chance.

Table 5

Percent of day outlier cases that are profitable, by diagnosis-related group (DRG) weight and number of outlier days: Fiscal year 1989

Number of outlier days	All DRG weights		DRG weight ≤ 2		2 < weight ≤ 4		DRG weight > 4	
	Number of cases	Percent profitable						
All days	28,248	10.3	14,167	2.7	8,784	17.2	1,222	31.4
1-10	14,167	2.7	9,872	0.7	3,907	6.1	388	18.6
11-40	10,779	12.1	6,625	6.4	3,603	19.6	551	31.6
40-100	2,816	36.1	1,471	28.4	1,091	43.6	254	48.4
100-134	486	41.8	274	33.6	183	52.5	29	51.7

NOTE: Based on adjusted data.

SOURCE: (Carter and Farley, 1992).

Table 6

Number of hospitals and cases, and percent of outlier cases, average outlier payments, and percent distribution of outlier payments, by adjusted pre-outlier dollar loss category: Fiscal years 1988 and 1989

Average pre-outlier dollar loss per case	Number of hospitals	Number of outlier cases		Percent of outlier cases		Average outlier payment per case		Percent of outlier payments	
		1988	1989	1988	1989	1988	1989	1988	1989
Total	5,259	1,625,879	1,649,517	4.8	2.5	\$243	\$256	100.0	100.0
≥ 3,000	177	21,264	23,722	7.0	12.8	463	1,287	2.5	7.2
2,000 to 2,999	202	73,364	74,474	6.7	3.6	378	489	7.0	8.6
1,000 to 1,999	764	290,036	298,182	6.1	3.1	325	365	23.8	25.8
0 to 999	2,410	815,581	826,410	4.7	2.2	223	212	46.0	41.3
- 1,000 to - 1	1,586	387,640	388,477	3.6	1.6	182	167	17.9	15.4
≤ -1000	120	37,994	38,252	4.5	1.9	283	186	2.7	1.7

SOURCE: (Carter and Farley, 1992).

Both the case-weighted and hospital-weighted risks were similar in FYs 1988 and 1989 for the adjusted payments. Although these results indicate that change in outlier policy did not reduce risk, it does not account for other changes in risk.

Independent of the outlier policy, risk grew substantially between FYs 1988 and 1989. The standard deviation of cost increased by 14 percent between FYs 1988 and 1989, and revenues increased less than 5 percent. Thus, there was more risk to be ameliorated in FY 1989 than in FY 1988. When we simulated the outlier policy for FYs 1988 and 1989 on the FY 1989 adjusted data, we obtained risk values of 1.72 and 1.63, respectively. Thus, the outlier change actually reduced risk by 5.2 percent ($= 100 \times (1.72 - 1.63)/1.72$) from what it would have been under earlier outlier policy. It is worth noting that the old outlier policy also substantially reduced risk compared with what it would have been in the absence of outlier payments. Thus, the new policy improves on an already successful aspect of outlier policy.

Distribution of outlier payments

Table 7 compares adjusted FYs 1988 and 1989 outlier payments for classes of hospitals defined by geography, size, and characteristics that we expect are correlated with hospitals having a relatively costly case mix.

Rural hospitals' outlier payments declined from an average of \$79 per case to \$73. These hospitals received 7.3 percent of all outlier payments in FY 1988 but only 6.4 percent in FY 1989. For comparison, the last two columns of the table present average profit per case.¹³ In FY 1988, rural hospitals had the lowest average profit of the three geographical types; by 1989, they had the highest average profit. This of course had nothing to do with the change in outlier policy, but rather with the change in rate structure.

The Middle Atlantic and Pacific Divisions gained the largest increase in outlier payments from the policy

change. In the case of the Middle Atlantic, this might be viewed as undesirable because it was the most profitable division in FY 1988.

New England's share of outlier payments declined, despite the fact that it is the least profitable of any region. Thus, the FY 1989 policy increased the disparity among divisions in profitability.

Outlier payments increase with increasing bed size; the effect was actually even stronger in FY 1989 than it was in FY 1988. Profits were strongly related to bed size in FY 1988 but less so in FY 1989.

The policy change caused relatively little change in the distribution of payments by hospital characteristics that are correlated with high-cost cases. There was a slight shift of outlier payments towards minor teaching hospitals and away from both non-teaching and major teaching hospitals. There was also a decrease in the share of outlier payments received by disproportionate share hospitals. On the other hand, the policy change increased the share of outlier payments that went to hospitals with the highest case mix. It had almost no effect on the share of outlier payments received by the 10 percent of hospitals that received the highest proportion of cases as transfers.

Hospital response to outlier policy

Any policy assessment should include an attempt to understand how, if at all, the policy affected behavior. We performed several analyses that tested hypotheses about how profit-seeking hospitals might have responded to the PPS incentives.¹⁴ In this section, we summarize our findings regarding hospitals' responses to removal of the "notch" in outlier policy and the issue of dumping of expensive cases.¹⁵

Hospitals' response to the notch

Under the previous outlier policy, cases that exceeded both the day outlier threshold and the cost outlier threshold were paid the day outlier supplement. This gave hospitals an undesirable incentive related to the

¹³The profit numbers are not identical to the PPS margins calculated from the Medicare Cost Report because of differences in methodology for calculating costs, including our inclusion of total costs rather than just covered costs, different timeframes, our use of only a sample of cases, and our use of case weighting.

¹⁴See Keeler et al. (1988) for a theoretical discussion of the behavioral incentives related to PPS and outlier policy.

¹⁵Additional results are reported in Carter and Farley (1992).

Table 7

Comparison of adjusted payments, by selected hospital characteristics: Fiscal years 1988 and 1989

Hospital characteristic	Outlier payment per case		Percent of outlier payment		Profit per case	
	1988	1989	1988	1989	1988	1989
Rural	\$79	\$73	7.3	6.4	\$ -55	\$ -190
Small urban	240	259	38.3	39.6	127	-245
Large urban	343	362	54.2	54.0	81	-316
Geographic Division:						
New England	425	386	10.1	8.6	-403	-721
Middle Atlantic	461	537	25.8	27.6	476	236
South Atlantic	252	250	17.6	17.0	-24	-566
East North Central	182	185	14.2	13.5	25	-294
East South Central	171	160	6.2	5.5	61	-132
West North Central	134	127	4.7	4.3	109	-160
West South Central	183	186	8.3	8.3	45	-231
Mountain	156	180	2.8	3.1	133	-153
Pacific	208	266	10.1	12.2	0	-316
Beds:						
0-49	55	42	1.3	0.9	-118	-215
50-99	79	74	3.3	2.9	-26	-169
100-199	160	157	13.6	12.7	-2	-290
200-299	241	248	20.5	20.2	9	-370
300-499	305	339	34.4	36.3	142	-245
500 or more	426	452	26.8	27.1	240	-167
No teaching						
Minor teaching	166	169	39.5	38.2	-50	-352
Major teaching	306	336	42.3	44.0	144	-250
Not disproportionate share						
Disproportionate share	524	544	18.1	17.8	569	351
CMI < 1						
1.00 ≤ CMI < 1.25	192	212	49.4	51.8	-32	-363
1.25 ≤ CMI < 1.50	328	329	50.6	48.2	234	86
1.50 ≤ CMI	34	31	0.6	0.5	-59	-110
Transfer < 2 percent	199	197	44.2	41.6	-3	-288
Transfer > 2 percent	308	334	43.4	44.8	179	-213
	391	454	11.6	13.1	148	344
	230	242	83.9	83.8	50	-268
	347	367	16.1	16.2	219	-191

NOTE: CMI is case-mix index.

SOURCE: (Carter and Farley, 1992).

relatively small number of cases that are cost outliers and then cross the day outlier threshold. On the day that the cost outlier case crossed the day outlier threshold, the hospital instantaneously lost a substantial amount of money (the cost outlier payment minus a single day's per diem) and thus there was an incentive to discharge the patient before this would happen. This incentive was removed in FY 1989 by the provision that pays cases that exceed both thresholds the maximum of the amount from the day formula or the cost formula.

The question we would like to ask is whether hospitals responded to the unfortunate incentive in the previous policy by discharging cases that were not ready for discharge. We do not have data on clinical status or on what hospitals would have done under circumstances other than those that occurred. But we can examine whether a large number of discharges occurred in the days immediately before the day outlier threshold relative to expectations built on statistical data.

We analyzed discharges during FYs 1987 and 1988. Because the results were very similar in the 2 years, we present only our results for FY 1988 data. In order to examine discharges prior to the day outlier threshold, we calculated the hazard function associated with the discharge process within the 10 DRGs with the most

FY 1988 discharges. For each day of the stay, the hazard function gives the discharge rate, defined as the proportion of cases that were discharged out of all those present at the beginning of the day.

We use two standards to determine whether the discharge rate is larger than expected in the days immediately before the day outlier threshold. The first standard is the discharge rate for the days immediately following the day outlier threshold in FY 1988. If many DRGs show a large drop in the discharge rate at the day outlier threshold point, one would be suspicious that some discharges occurred before the threshold in order to obtain higher payments. The second standard is the hazard function for FY 1989. The notch in payment was removed in FY 1989 so hospitals did not lose payments at any point in the LOS distribution. So, if the discharge rate was substantially higher in FY 1988 than in FY 1989 in the days immediately preceding the FY 1988 threshold and not at other portions of the stay, we would again be suspicious that some of the FY 1988 cases had been discharged in order to obtain higher payments.

Table 8 shows the hazard function in the neighborhood of the FY 1988 day outlier threshold for each of the 10 most frequent DRGs in FY 1988. The second row of the table concerns FY 1988 discharges in

Table 8
Discharge rates for days near fiscal year 1988 day outlier threshold, by the 10 most frequent diagnosis-related groups

Diagnosis-related group	Threshold	Sample at start of period	Discharge rate for day relative to threshold				
			-2	-1	0	1	2
Percent of 1988 cases							
Total	NA	16,883	12.8	12.0	11.5	10.2	10.6
14	25	3,517	8.0	7.8	8.1	7.6	8.8
15	17	855	14.9	16.6	17.6	14.6	11.0
89	25	1,784	12.4	11.8	9.9	9.7	10.6
96	20	1,219	14.5	14.6	13.6	10.5	12.5
127	24	2,815	11.3	10.8	10.7	10.4	10.4
138	20	857	13.3	12.0	12.7	10.2	12.1
140	14	2,032	25.0	19.8	21.7	16.3	18.9
182	19	1,366	14.1	14.6	12.5	10.6	13.4
209	28	1,073	8.7	10.8	9.8	9.9	8.9
296	24	1,365	10.0	9.9	7.6	9.0	6.2
Percent of 1989 cases							
Total	NA	17,584	12.2	11.7	10.5	9.7	9.5
14	25	3,717	9.0	7.9	7.4	7.0	7.2
15	17	713	15.8	12.7	12.0	13.2	14.3
89	25	2,018	11.6	12.0	10.1	9.7	9.5
96	20	1,198	13.4	14.9	12.8	11.9	10.3
127	24	3,002	11.3	10.7	10.3	8.9	7.4
138	20	879	14.2	13.0	12.0	8.3	12.5
140	14	1,898	19.8	19.9	19.2	17.9	16.6
182	19	1,526	13.6	12.7	11.1	11.0	12.1
209	28	1,067	10.6	11.2	9.2	9.0	9.9
296	24	1,566	9.3	9.7	8.4	8.3	7.2

NOTES: Complete diagnosis-related group titles may be found in, for example, *Federal Register* (1988). NA is not applicable.

SOURCE: (Carter and Farley, 1992).

DRG 14 which contains stroke patients. The outlier threshold in that DRG in FY 1988 was at day 25, and the table contains the discharge rate for each day from day 23 to day 27. Cases discharged on days 23 through 25 could be paid a cost outlier supplement, but those discharged on days 26 and 27 could not. There were 3,240 cases still in the hospital in DRG 14 at the beginning of day 23. Eight percent of these cases were discharged on day 23; 7.8 percent of the cases that remained in the hospital at the beginning of day 24 were discharged on day 24, and so on.

The data also show that for each DRG the discharge rate declines with day of stay, but there is no hint of a sharp discontinuity in the discharge rate. The discharge rate for FY 1989 is indeed lower than that for FY 1988 at the point in the stay immediately preceding the FY 1988 day outlier threshold, but it was also lower immediately following the FY 1988 day outlier threshold.

The preceding analysis provides no evidence of a notch effect. The notch, however, potentially affects only a small number of cases—those that were cost outliers on the day they crossed the day outlier threshold or would have been if they remained in the hospital instead of being discharged. We cannot identify these cases with certainty because we do not know the incremental costs associated with each day in the stay and thus we cannot repeat our hazard analysis for only these cases. Instead, we have examined the

percent of FY 1988 discharges that exceeded the cost outlier threshold as a function of LOS.

In the absence of response to the notch, one would expect the percent of discharges that exceed the cost outlier threshold to be a steadily increasing function of LOS. If hospitals were responding to the notch by discharging cost outlier cases before the day outlier threshold, one would expect to see an increase in the value of this function in the days preceding the outlier threshold. We found no evidence of an increase in discharges of cost outliers preceding the day outlier threshold; the percent of discharges that exceed the cost outlier threshold is a steadily increasing function of LOS in all 10 of the DRGs studied.

Hospitals of last resort

Hospital responses to changes in outlier policy may extend beyond how they manage the treatment of their patients to actual selection of patients based on risk of financial loss. This may include not admitting patients they think will be expensive cases or transferring those patients to other facilities following admission. If such behavior is occurring, we might expect to find a greater concentration of high-cost or long-stay patients at hospitals of last resort (i.e., public facilities) as a result of actions by private hospitals to reduce risk of losses on expensive cases. We look for this phenomenon in this part of our study.

Our analysis describes temporal changes in the percent of very expensive cases and transfer cases in hospitals of last resort. Under the new outlier policy, with the greater of day or cost outlier payments being paid for cases that qualify as both day and cost outliers, hospitals may be less likely to avoid treating potentially expensive cases. Thus, if patient selection behavior had been occurring, we might see the shares of expensive cases in hospitals of last resort decline in FY 1989 relative to other hospitals.

As previously discussed, we limited this analysis to hospitals in large urban areas. We defined government-owned hospitals as hospitals of last resort and compare measures for these hospitals with all other hospitals in large urban areas. We calculated the proportion of the most expensive 5 and 15 percentiles of cases in hospitals of last resort and other hospitals. These measures were calculated by quarter for the last three quarters of FY 1986 and for full FYs 1987 through 1989, thus providing 15 time trend data points.

We investigated two aspects of possible hospital behavior using these measures. First, we looked at the proportion of high-cost cases treated by hospitals of last resort, compared with proportions in other hospitals. Changes in relative proportions of expensive cases between hospital groups, if observed, could reflect a variety of possible patient selection behaviors. Second, we focused specifically on the proportion of these high-cost cases among cases transferred to hospitals of last resort versus transfers to other hospitals. This allowed us to focus on one of the direct forms of selection, that of patient dumping.

We found no evidence of patient selection based on the proportion of expensive cases in hospitals of last resort. As shown in Figure 1, using either the 5th or 15th percentile as the definition of expensive cases, the percent of expensive cases in hospitals of last resort is almost identical to the percent of expensive cases in other large urban hospitals. Also, there has been no noticeable trend over time. We tested for the existence of trends by OLS regression of the logit transform of the fraction of cases that were expensive. The regressions were not statistically significant, however.¹⁶

The number of transfer cases is increasing in large urban areas. This result is consistent with ProPAC (1990) findings of increasing numbers of transfer cases. Although the rate of increase of transfer cases was slightly greater at local government-owned hospitals than at other hospitals, we did not find the difference to be statistically significant. Nor were the FY 1989 rates for discharges statistically different from those that would have been expected based on the earlier trend.

Transfer cases are much more likely than other cases to be very expensive. Figure 1 also plots the fraction of cases that were transfers from other short-term general hospitals that met our definition of very expensive cases. Because of the smaller size of the denominator,

these numbers exhibit substantial quarter-to-quarter variation. We could not reject the null hypothesis of no trend.¹⁷

These analyses provide no evidence that hospitals of last resort were being used as a dumping place for expensive Medicare cases. The fraction of their cases that were very expensive did not change over time and remained similar to the experience of other hospitals in large urban areas. Although the fraction of their cases that were transferred from another short-stay hospital increased slightly over time, the same phenomenon was found at other hospitals in large urban areas. The increase in transfer cases could arise from several causes other than dumping (e.g., increased specialization). Because we have no evidence of a problem, it is not surprising that we found no evidence of a change in FY 1989 because of the change in outlier policy.

Conclusions

The outlier policy introduced in FY 1989 appears to have accomplished several of its goals. In particular, the new policy succeeded in:

- Concentrating outlier funds on the costliest cases.
- Providing more funds to those hospitals that have cases that are more costly than average for their DRG.
- Decreasing risk by 5 percent from what it would have been if the policy had not been changed.

The reduction in risk is particularly important because, in the absence of outlier payments, risk would be increasing. The reduction in risk is equivalent to that which would result from about a 39-percent increase in outlier payments. This estimate is based on the fact that the risk reduction caused by the policy was three times larger than the decrease in risk accomplished by the 13-percent increase in outlier payments because of the final year of the transition to full Federal payments under PPS.¹⁸

The FY 1989 policy does not ameliorate the problem of profitable outlier cases. In both FYs 1988 and 1989, more than 18 percent of outlier funds went to profitable cases, and some of these funds would have been better spent on other cases.

We believe that most of the problem of profitable outlier cases is because of inappropriate amounts of day outlier payments. Eighty-one percent of the profitable outlier cases were paid using the day outlier formula. Although the FY 1989 policy identified much less costly cases as day outliers, the formula for computing the payment remained the same. Further, we found that, on

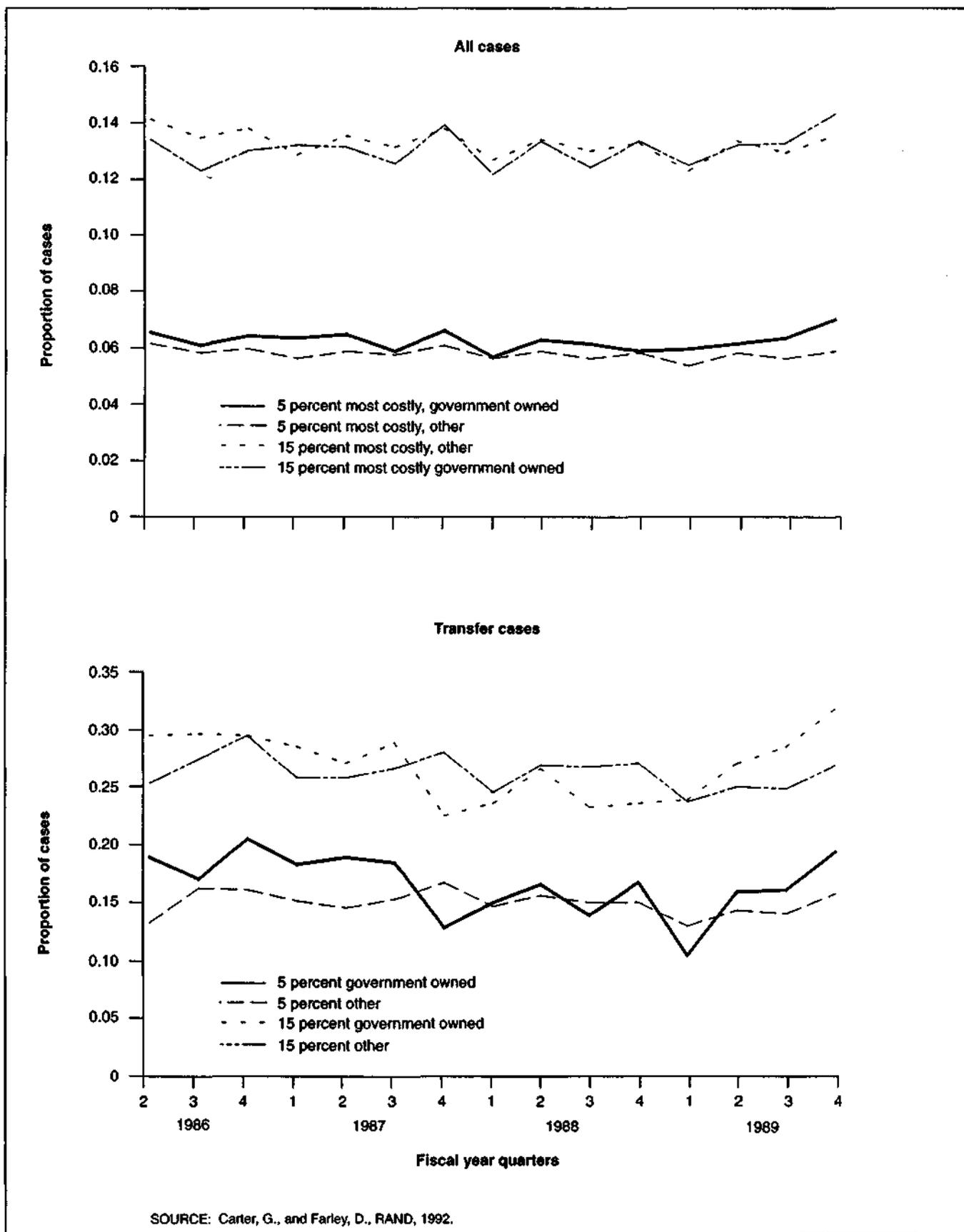
¹⁷For government-owned hospitals, the *F*-statistics for a trend in the data for the 5th and 15th percentiles of expensive cases were 2.34 and 0.64, respectively (d.f. = 1,13). Similar numbers for other hospitals were 0.44 and 1.64. Adding a dummy variable for FY 1989 did not bring any of these regressions up to a 0.05 significance level.

¹⁸The estimate is also consistent with our simulations of larger outlier pools. Using regression to interpolate between our three data points, we estimate that, under current policy, it would require an outlier pool of 7.5 percent to produce another 5-percent decrease in our risk measure. Because actual outlier payments were 5.5 percent, this corresponds to a 36.4-percent increase in the pool.

¹⁶For government-owned hospitals, the *F*-statistics for a trend in the data for the 5th and 15th percentiles of expensive cases were 0.01 and 0.97, respectively (d.f. = 1,13). Similar numbers for other hospitals were 3.17 and 3.3. Adding a dummy variable for FY 1989 reduced these numbers.

Figure 1

Trends, by quarter, in the proportion of cases in large urban areas that were very expensive, for all cases and transfer cases, by hospital ownership and cutoff for expensive cases: Fiscal years 1986–89



average, the larger the number of days being paid a day outlier supplement, the higher the average profit. This is consistent with outlier payments being higher than the cost of the services delivered on an outlier day and with the study of incremental costs by Carter and Melnick (1990). See Carter and Rumpel (1992) for further analyses on the relationship between outlier payments, the cost of outlier cases, and LOS.

Nineteen percent of the profitable outlier cases are because of the differences between costs estimated via the RCC used in the cost outlier formula and costs estimated via the departmental methodology. Although the departmental methodology should produce better estimates of the cost of a case than the RCC method, it is not without serious problems including the possibility that the cost of high-cost cases is biased downwards (Rogowski and Byrne, 1990). A recent ProPAC sponsored study compared costs estimated by the departmental methodology with those estimated by sophisticated hospital cost accounting methods in use at 18 hospitals, many of which were large, urban teaching hospitals (Ashby, 1991). They found that the Medicare Cost Report overestimated the cost of Medicare cases by 4.4. Further, they found that routine and special care costs were overestimated by 12.6 percent and ancillary costs were underestimated by 4.9 percent by the cost report. The problems inherent in the method are increased here by the fact that most of the PPS5 cost reports we used were unaudited and that many of the sample cases fall outside the timeframe of the available cost reports.

The FY 1989 outlier policy change also offered an opportunity to observe whether hospitals respond to the details of outlier policy. We found no evidence of response to the notch in the previous policy nor any evidence of increasing concentration of very expensive cases in hospitals of last resort. Carter and Farley (1992), however, found that hospitals responded to the outlier policy change both in increasing length of stay and by increasing the services delivered to the most costly patients. There was a greater incentive to provide additional services to patients who stayed beyond the day outlier threshold in FY 1989 than in earlier years, and thus, although the magnitude of the changes were not extremely large, there is some evidence that hospitals do respond to the details of outlier policy.

In conclusion, the recent outlier policy change was a substantial improvement over its predecessor. Further changes including lowering the payment rate for day outlier days and improving the adjustment of charges to costs might enable the policy to be even more effective.

Technical note

In order to examine the concentration of expensive cases in hospitals of last resort, we defined two groups of expensive cases: those whose costs exceed the average for their DRG by a dollar amount that ranked in the largest 5 percent (or 15 percent) of all such deviations across all DRGs. The very expensive cases

were identified using the log normal approximation to the distribution of charges. A case was classified as very expensive when:

$$\text{Case cost} = RCC_k * (\text{totchg}_{ijk} - \text{mnchg}_i) > \text{cutoff} \quad (1)$$

where

$$\text{cutoff} = \frac{1}{N} \sum_{i=1}^N (\exp(\mu_i + \sigma_i * a) - \exp(\mu_i)) * N_i / N_i \quad (2)$$

and

- RCC_k = ratio of cost to charges for hospital k .
- totchg_{ij} = total charge for case j in DRG i and hospital k .
- mnchg_i = mean charge for all cases in DRG i .
- μ_i = mean of the log of costs for cases in DRG i .
- σ_i = SD of the log of costs for cases in DRG i .
- a = multiplier based on the normal distribution.
- N_i = number of cases in DRG i .

The cutoffs were obtained by calculating an annual average cutoff for each fiscal year and interpolating the quarterly cutoffs, thus capturing cost and charge increases over time. The 5th and 15th percentile cutoffs were obtained using multipliers of $a = 1.645$ and $a = 1.000$, respectively, in equation (2).

References

- Ashby, J.L. Jr.: *The Accuracy of Cost Measures Derived from Medicare Cost Report Data*. The Prospective Payment Commission. Washington, DC. Oct. 1991.
- Carter, G.M., and Farley, D.O.: *Improving Medicare's Policy for Payment of Unusual Hospital Cases*. RAND Pub. No. R-4216-HCFA. Prepared for Health Care Financing Administration. Santa Monica, CA. RAND, 1992.
- Carter, G.M., Melnick, G.A.: *Patterns of Resource Use Within Medicare Hospital Stays*. RAND Pub. No. R-3870-ProPAC. Prepared for the Prospective Payment Assessment Commission. Santa Monica, CA. RAND Corporation, Mar. 1990.
- Carter, G.M., Rumpel, J.D.: *Payment Rates for unusual Medicare Hospital Cases*. RAND Pub. No. R-4208-HCFA. Prepared for Health Care Financing Administration. Santa Monica, CA. RAND Corporation, 1992.
- Congressional Research Service: *Medicare's Prospective Payment System: An Analysis of the Financial Risk of Outlier Cases*. Washington, DC. Library of Congress. Report 87-877EPW. Nov. 5, 1987.
- Federal Register*: Medicare Program; Changes to the Inpatient Hospital Prospective Payment System and Fiscal Year 1991 Rates. Vol. 55, No. 171, 35990-36175. Office of the Federal Register, National Archives and Records Administration. Washington. U.S. Government Printing Office, Sept. 4, 1990.

Federal Register: Medicare Program; Changes to the Inpatient Hospital Prospective Payment System and Fiscal Year 1989 Rates. Vol. 53, No. 190, 38476-38640. Office of the Federal Register, National Archives and Records Administration. Washington. U.S. Government Printing Office, Sept. 30, 1988.

Ellis, R.P., and McGuire, T.G.: Insurance Principles and the Design of Prospective Payment Systems. *Journal of Health Economics* 7:215-237, 1988.

Keeler, E.B., Carter, G.M., and Trude, S.: *Insurance Aspects of DRG Outlier Payments*. RAND Pub. No. N-2762-HHS. Prepared for Health Care Financing Administration. Santa Monica, CA. RAND Corporation. Oct. 1988.

Newhouse, J.P.: Do unprofitable patients face access problems? *Health Care Financing Review* 11(2):33-42. HCFA Pub. No. 03292. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Winter 1989.

Newhouse, J.P., Cretin, S., and Witsberger, C.J.: Predicting hospital accounting costs. *Health Care Financing Review* 11(1):25-33. HCFA Pub. No. 03286. Office of Research and Demonstration, Health Care Financing Administration. Washington. U.S. Government Printing Office, Fall 1989.

Price, K.F.: Pricing Medicare's diagnosis-related groups: Charges versus estimated costs. *Health Care Financing Review* 11(1):79-90. HCFA Pub. 03286. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Fall 1989.

Prospective Payment Assessment Commission: *Medicare Prospective Payment and the American Health Care System: Report to the Congress*. Washington. U.S. Government Printing Office, June 1990.

Rogowski, J.R., and Byrne, D.J.: Comparison of alternative weight recalibration methods for diagnosis-related groups. *Health Care Financing Review* 12(2):87-101. HCFA Pub. No. 03316. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Winter 1990.

Trude, S., and Carter, G.M.: *A Description of Expensive and Long-Staying Patients*. RAND Pub. No. N-2998-HCFA. Prepared for Health Care Financing Administration. Santa Monica, CA. RAND Corporation, Oct. 1989.

Witsberger, C., and Kominski, G.: *Recent Trends in Length of Stay for Medicare Surgical Patients*. RAND Pub. No. R-3940-HCFA. Prepared for Health Care Financing Administration. Santa Monica, CA. RAND Corporation, Aug. 1990.