Do unprofitable patients face access problems?

by Joseph P. Newhouse

Tests were conducted to determine whether implementation of the prospective payment system caused access problems for patients with an above-average likelihood of being unprofitable. Since implementation, patients in diagnosis-related groups that are, on average, unprofitable are not more likely to be transferred. However, they are more likely to be found in hospitals of last resort (the only evidence from these tests indicating access problems). Outlier patients are not more likely to be found in last-resort hospitals. The access issue will continue to bear scrutiny, but there is not as yet evidence that it is a serious problem.

Introduction

The advent of the prospective payment system signaled an attempt to obtain greater efficiency in the Medicare program and to make Federal outlays more controllable than in the past. In return for the greater efficiency and control of outlays, however, there could well be reduction in some beneficiaries' access to care (Newhouse, 1983; Dranove, 1987).

The potential reduction in access fundamentally stems from the inability to match reimbursement at the individual level with the expected cost at the time of admission. Before the prospective payment system (PPS) was implemented, such matching was irrelevant to access because cost reimbursement made it financially attractive, or at least not disadvantageous, to take care of any Medicare patient. By contrast, certain individual patients may now be identified at admission or during the course of the stay as likely to reduce the hospital's operating margin, because the reimbursement the hospital receives will not cover the costs incurred in treating those patients. Thus, each hospital has a financial incentive to structure admitting and referral arrangements so that such patients are cared for elsewhere.

In the context of PPS, the potential access problem most remarked upon is the predictably high-cost patient within a diagnosis-related group (DRG), the so-called severely ill patient. Such patients may face a problem of access to care because any hospital can improve its profitability, at least in the short run, by admitting fewer of them (Schiff, Ansell, and Schlosser, 1986; Himmelstein et al., 1984). Informally, this process is referred to as dumping and its opposite as skimming (Oday, Siegel, and Parachini, 1987; Relman, 1986). I will mainly use the more neutral term "selection" to refer to both dumping and skimming.

PPS contains safeguards that should mitigate the selection problem. Outlier payments, in principle,

limit the loss a hospital can suffer on any individual case and therefore reduce the incentive to not admit the unprofitable patient, although the precedence of day over cost outliers weakened this incentive in the period examined here. Peer review organizations review transfer cases in order to enforce antidumping provisions in the law. Nonetheless, the financial gain remains for any hospital that can successfully circumvent these safeguards.

A direct test of whether severely ill patients within a DRG face access problems has been complicated by the difficulty of measuring severity. Here I use an indirect approach to test for access problems by exploiting the variation between DRGs in mean accounting profits. I use the term "accounting profit" to emphasize that the empirical measures of profit in the literature, as well as those used in this article, are not measures of economic profit; the assumption maintained in this article is that accounting profit is correlated with economic profit. The distinction between the two is further discussed later.

In theory, DRG weights were set proportional to the average accounting cost of cases in a DRG, so that all DRGs were, on average, to be equally profitable. In practice, however, this did not happen because of the lag in computing the cost of cases in a given DRG and any intervening coding change or medical practice change. For example, the weights in 1984 were set on the basis of 1981 costs, but because of coding changes from 1981 to 1984, it is likely that quite different types of cases appeared in many DRGs in 1984 (Ginsburg and Carter, 1986). Moreover, the technology related to some DRGs changed, which may have increased or decreased cost. Hence, actual accounting profits should not be expected to be the same in each DRG.

Indeed, the DRGs do differ in their actual accounting profitability. Two different tests of selection are based on this difference in accounting profitability: Specifically, tests of whether patients in DRGs that had negative accounting profits were more likely than other patients to be transferred from hospitals other than those of last resort and whether they were more likely to be cared for in hospitals of last resort. Because of within-DRG variance, there will be profitable patients in every DRG, just as there are unprofitable patients in every DRG. Nonetheless, unprofitable patients in DRGs with mean negative accounting profits will be either more numerous or

more unprofitable or both, so tests of selection based on between-DRG variation in mean profit have a theoretical rationale.

A third test of selection behavior is based on outlier patients. Almost all outlier patients generate accounting losses, and very likely economic losses as well (Keeler, Carter, and Trude, 1988). Therefore, a hospital's short-run profitability is damaged by admitting more patients who will become outliers. Hence, we ask whether hospitals of last resort are more likely than other hospitals to admit outlier patients.

Methods

Accounting profit by diagnosis-related group

Data with which to compute accounting profits come from a 20-percent sample of bills of Medicare patients in 1984. The methods are briefly sketched here. Each charge in an ancillary department is deflated by a cost-charge ratio specific to that department at that hospital; the ratio comes from the 1984 Medicare cost report.[1] Days in special units are valued at the cost of a special-unit day as shown on the cost report, and days in regular units are valued at the cost of a regular-unit day. Costs from ancillary departments, regular units, and special units are then summed for each patient stay.

The resulting imputed costs of a stay are compared with the reimbursement the hospital received for that stay. The accounting profit or loss on each case is then computed as the difference between the reimbursement the hospital received and the imputed cost. The accounting profit or loss on each case is averaged across all cases in the DRG in the 20-percent sample, and an average accounting profit or loss is calculated for each DRG.

Accounting profit differs from economic profit in several ways. First, capital costs are reimbursed on a passthrough basis. Because capital is valued at historical cost, the true capital cost, which would be based on a current rental rate or a replacement rate, is likely to be greater than the amount reimbursed, especially in DRGs that are capital intensive. For this reason a measure of accounting profit will tend to be an overstatement of economic profit. Three factors could change this conclusion. First, to the degree that the economic life assumed for accounting purposes is artificially short, the accounting cost could be an overstatement of the economic cost. Second, some instances of technological progress—for example, microcomputers—could cause real prices for a constant product to fall. If, because of a low rate of

general inflation, nominal prices also fell, valuation at historical costs would be an overstatement of capital costs. Third, if current interest rates were below the interest rates used for reimbursement purposes, accounting costs would be overstated. Nonetheless, it seems likely that the effect of general inflation on nominal prices will usually outweigh all three of these effects.

Unfortunately, there are two other differences between accounting profit and economic profit that go in the other direction, so the overall direction of bias is unknown. For example, accounting costs are average costs, not marginal costs. Hence, accounting profit is average profit, not marginal profit, yet a hospital seeking to maximize profit acts on the basis of marginal profit. The average profit could be negative and the marginal profit zero (if marginal cost is below average cost), in which case accounting profit would be understated. Nonetheless, it seems unlikely that the relationship between average and marginal cost should differ markedly across DRGs. If the relationship does vary to any great extent, the ranking of DRGs by their accounting profits will be informative.

Furthermore, accounting costs are fully allocated costs. The hospital produces many types of care—471 DRGs, for example—with some common inputs, such as the administrator's salary. How the costs of the common inputs are allocated to DRGs is arbitrary, but the allocation will affect the accounting profitability of various DRGs. Common costs cause the opposite bias from capital costs. For the most part, they should not enter a calculation of marginal profit. To the degree that they do, the estimate of marginal economic profit is understated.

In sum, researchers in this field are constrained to use a measure of accounting profit that may or may not correspond well to true economic profit. Because no one has been able to measure the latter, one has no way of knowing how good the correspondence is. As a result, tests based on accounting profit may fail to show selection for two reasons: Either selection may not be occurring at measurable levels, or the measures of accounting profit may simply have too much measurement error. Conversely, if tests based on accounting profit do confirm the existence of selection, it can be inferred that accounting profits do measure some component of economic profit (or that hospital administrators act on the basis of accounting profit).

The DRGs with negative accounting profit, the magnitude of the mean loss, and the estimated frequency of cases are given in Table 1. I use absolute profit rather than profit rates as a measure of profitability. For the most part, the distinction is irrelevant because the key division is between DRGs with positive and negative profits. Additionally, however, most hospitals were not capacity constrained in 1984 and 1985, so admitting a case with a high absolute but low relative profit did not preclude admitting other, relatively more profitable cases.

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[1]After the calculations for this article were completed, a minor error was discovered in the calculation of accounting profit; direct medical education and capital costs allocated to the ancillary departments were mistakenly included in cost-charge ratios. As a result, cost-charge ratios are overstated, but by less than 1 percent, on average. Because of the small magnitude of the error and because it is likely to affect various DRGs nearly equally, we have not gone to the expense of correcting it.

Table 1

Diagnosis-related groups (DRGs) with negative accounting profits for Medicare patients and number of cases: United States, 1984

DRG	Short name	Mean accounting profit	Estimated number of cases[1]
389	Full-term neonate with major problems[2]	–$3,353	60
390	Neonates with other significant problems[2]	–2,027	60
76	Operating room procedure on the respiratory system, except major chest procedure with complicating condition	–1,126	8,640
392	Splenectomy, age 18 years or over	–1,116	1,580
71	Laryngotracheitis	–942	160
67	Epiglottitis	–913	270
190	Other digestive system diagnoses, age 17 years or under[2]	–873	140
21	Viral meningitis	–815	385
255	Fracture, sprains, strains, and dislocations of upper arm and lower leg except foot, age 17 years or under[2]	–669	15
288	Operating room procedures for obesity	–560	420
27	Traumatic stupor and coma, coma more than 1 hour	–461	1,745
380	Abortion with dilatation and curettage[2]	–445	85
417	Septicemia, 17 years or under[2]	–390	25
57	Tonsil and adenoid procedure except tonsillectomy and/or adenoidectomy, age 18 years or over	–321	725
61	Laparoscopy and endoscopy (female)	–310	475
440	Wound debridements for injuries	–274	2,865
370	Cesarean section with complicating condition[2]	–258	195
164	Appendectomy, with complicated principal diagnosis, age 70 years or over or complicating conditions	–256	4,110
7	Peripheral and cranial nerve and other nervous system procedures, age 70 years or over	–219	5,780
159	Hernia procedures, except inguinal and femoral, age 70 years or over or complicating conditions	–177	19,665
465	Aftercare with history of malignancy or secondary diagnosis	–176	2,610
226	Soft tissue procedures, age 70 years or over or complicating conditions	–168	5,280
354	Nonradical hysterectomy, age 70 years or over or complicating conditions	–125	26,350
59	Tonsillectomy and/or adenoidectomy only, age 18 years or over	–111	290
91	Simple pneumonia and pleurisy, age 17 years or under[2]	–89	45
334	Major male pelvic procedures with complicating conditions	–72	6,905
73	Other ear, nose, and throat diagnoses, age 18 years or over	–28	9,870
268	Skin, subcutaneous tissue, and breast plastic procedures	–20	2,965
17	Renal failure with dialysis	–19	895
359	Tubal interruption for nonmalignancy	–9	100
123	Circulatory disorders with acute myocardial infarction, expired	–1	56,200

[1]Estimated as 5 times the number of cases in the 20-percent sample used.
[2]These DRGs may be data errors, but they have been kept in the analysis. Because of their small numbers, they have little effect on the results.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

I also use the national mean profit to classify DRGs. Absolute profits at any particular hospital, of course, will differ because of factor price variation and local practice patterns. Any such variation will reduce the power of the tests. Unfortunately, to determine the degree to which hospitals differ in the profitability of various DRGs would require estimating profitability by hospital by DRG. This would be cumbersome. In addition, such estimates would be problematic because of the small number of patients in many DRGs. If, however, the tests show evidence of selection, it can be inferred that the measure of profitability using the mean for the DRG across all hospitals is an adequate measure for these purposes.

The measure of profit used in the tests discussed in this article is what profit turned out to be at the end of the stay; i.e., it is ex post. However, the relevant measure of profit for behavior is ex ante; it is the profit the hospital expected at admission in the case of admission decision and the profit the hospital

expected for the duration of the stay in the case of a transfer decision. Early in the stay, of course, the hospital cannot predict profit on any individual patient with certainty, but if it had no ability to predict profit, there would be no selection. The concept of selection implies some predictive power; positive results for the tests of selection thus imply that there is some predictive power.

Defining last-resort hospitals

The premise underlying this article is that patients with problems of access are more likely than other patients to use hospitals of last resort. In general, these will be city or county hospitals. Certainly, it is this class of hospital that has been most prominent in the literature on dumping referred to in the introduction. Therefore, the crux of the method is to look for differences in behavior and in patient mix between hospitals of last resort and other hospitals—

specifically, to test for differences between city and county hospitals in large cities and other hospitals in large cities.

The study is limited to general medical and surgical hospitals. Specifically, I examine behavior at hospitals that have an American Hospital Association service code of 10, general medical and surgical, and have a third through sixth digit of 0001 through 0899 (which signifies short-term general and specialty hospitals in the Health Care Financing Administration set of identifiers). I exclude patients in hospitals and units that are exempt from PPS.

Within the set of general medical and surgical hospitals, I limit attention to hospitals in metropolitan areas of 1 million population or more, on the grounds that the division between hospitals of last resort and other hospitals may be less sharply defined in smaller areas. For example, in the limiting case of a rural county with one hospital, any dumping to another hospital would necessarily involve the patient's traveling outside the county.

Within metropolitan areas of 1 million or more, I have distinguished two groups of hospitals. The first group, termed the hospitals of last resort, have American Hospital Association control codes of 13-16, which are, respectively, county, city, city-county, and hospital district or authority. The second, or comparison, group of hospitals consists of all nongovernment not-for-profit hospitals and all investor-owned for-profit hospitals (control codes 21, 23, and 31-33) in those areas.

Because of the mechanics of PPS, profits at the two types of hospitals might differ for artificial reasons if the hospital types had a quite different distribution of fiscal year end dates. However, this is not the case. The percentage of last-resort hospitals with fiscal year end dates in the first through fourth quarters of the calendar year are 5, 38, 21, and 37; the corresponding percentages for other hospitals are 3, 53, 13, and 31.

Tests of selection

We first examined whether more cases were transferred out of comparison-group hospitals than last-resort hospitals, as the notion of selection would suggest. Moreover, if active attempts are made to reduce the number of unprofitable patients after admission, transfers ought to be more common in DRGs with negative expected profitability.

The analyses of transfers are based on data from a 5-percent random sample of bills from each of the first 2 years of PPS (approximately 1984 and 1985). Hereafter, I refer to these two time periods as PPS1 and PPS2, respectively.

The data files used for these tests were also used for other tests in which data from calendar year 1981 were examined. Therefore, only DRGs with positive numbers of patients in both the 1981 and the PPS1 samples were used in the PPS1 analysis, and only DRGs with positive numbers of patients in both the 1981 and the PPS2 sample were used in the PPS2 analysis. In addition, some DRGs that were distinct in

PPS1 and PPS2 were known to have been coded into a single DRG in the 1981 files. To preserve as much comparability as possible, the DRGs that were collapsed in the 1981 file were collapsed in the PPS1 and PPS2 files as well. The following DRGs were aggregated: 104 and 105; 106 and 107; 121 and 122; 195 and 197; 196 and 198; 387 and 388; 433-438; 456-460; 465 and 466. Additionally, cases coded as DRG 471 after October 1, 1985, were recoded to DRG 209.

The determination of whether a particular case had been transferred was based on whether it had a discharge destination of another short-term hospital, a code of 2 in the discharge destination field. Although there may be biases in the reporting of such data, it is not obvious that there should be differential reporting by type of hospital or by DRG.

In addition to simply examining the raw percentage of transfers at the two types of hospitals, I used the dummy variable indicating that a case was transferred as a dependent variable for a logistic regression. Two different specifications of the explanatory variable were used. The first was a dummy variable indicating whether the DRG, on average, had negative accounting profits; the second was a continuous variable showing the accounting profits of the DRG. With the former variable, of course, the far left tail of the distribution of profitability is emphasized.

Transfers may be more (or less) common in DRGs with negative accounting profits for reasons other than selection. Similarly, hospitals that are not last resort may have higher transfer rates for reasons other than selection, such as a lack of facilities. The preferred method of testing for selective transferring would be to control for the transfer rate by DRG or by hospital in 1981, before PPS was implemented. Unfortunately, data on transfers are not in the 1981 files, and so one cannot carry out such a test. For this and other reasons, it is important to conduct other tests of the existence of selection.

Although transfers are perhaps the most dramatic form of dumping, more subtle methods may be used to achieve the same effect. For example, hospitals might indicate to their staffs that they would prefer that certain cases be admitted elsewhere, or a hospital might try to restructure its staff so that it has more physicians who have a relatively small proportion of unprofitable patients in their practice.

A more omnibus test of selection behavior, then, is to determine whether hospitals of last resort are more likely than comparison-group hospitals to have unprofitable DRGs as part of their caseload. Such a test was formulated by ordering the DRGs by profitability.

First, all cases in each type of hospital (last resort and other) were ranked by the mean accounting profit of the DRG in PPS1, beginning with cases in the DRG with the most negative profit. One can then plot the cumulative distribution of these cases. If there is selection, the distribution of cases in hospitals of last resort ought to lie above the distribution of cases in other hospitals at all interior points. A Wilcoxon

statistic was used to test if the two distributions differed. The test was performed for both the PPS1 and PPS2 samples, although the accounting profit from PPS1 was used in both cases to order the DRGs. (No analogous accounting profit by DRG from PPS2 was available.)

Second, I tested whether patients in DRGs with negative accounting profits formed a higher proportion of cases at hospitals of last resort than at other hospitals; that is, I tested whether the cumulative distributions defined in the first test, when evaluated at zero accounting profit, differed.

Third, because zero accounting profit has an arbitrary element about it, I examined the cumulative probability at accounting losses of more than $100 per case and more than $200 per case.

As with transfers, even if there is a difference between the hospitals of last resort and other hospitals, it may be a difference that antedated PPS. In this case (unlike the analysis of transfers), one can test for a preexisting difference because the distribution of cases by DRG in 1981 is available. Unfortunately, the measure of preexisting differences is obscured by changes in coding from 1981 to 1984, so I have run tests both controlling and not controlling for the 1981 distribution of cases.

I also examined DRGs with high variance because they might be less appealing to a risk-averse hospital. Although no work has been done on how nonprofit firms act under uncertainty, Sandmo's (1971) model of a profit-maximizing but risk-averse firm under uncertainty generalizes straightforwardly to a nonprofit firm that is trying to maximize some function of quality and quantity subject to a demand constraint (Newhouse, 1970) or behaving as a physicians' cooperative (Pauly and Redisch, 1973). This subject was also discussed by Leland (1972). If risk-averse hospitals do avoid patients in DRGs with higher variance, controlling for mean profit rates, then such DRGs would be found to a greater degree at hospitals of last resort.[2]

This hypothesis, along with a yet more omnibus test of the effect of the probability of DRGs, can be tested by seeing if the difference between the frequency of DRG(i) in hospitals of last resort in a given year compared with its frequency in other hospitals in that year is a function of the mean profitability of DRG(i) and the variance of profit per case within DRG(i).

Finally, one can examine the distribution of outlier cases to test whether they differentially appear in hospitals of last resort. Almost all outlier cases generate accounting losses (Keeler, Carter, and Trude, 1988). As noted earlier, it is quite likely that outlier cases generate economic losses as well. To test whether the distributions of outliers differ between the two types of hospitals, I computed the percentage of

cases in each type that were outliers for PPS1 and PPS2.

As in the previous tests, any difference between the two types of hospitals could have been a preexisting difference. Hence, I also computed the percentage of outliers by hospital type for calendar year 1981. Outlier cases in 1981 were defined by applying the PPS1 outlier rules to 1981 cases, with monetary outlier thresholds deflated to 1981 values using the hospital market basket as a deflator. I unavoidably overestimated the number of outlier cases in 1981 because, according to the PPS1 rules, a transfer case could not be an outlier and, as noted earlier, I did not know which cases were transfers in 1981. In PPS2, transfer cases could be cost outliers only. Because the two types of hospitals differ relatively little in the proportion of transfers, the inability to make this correction is not important for present purposes, although it does inflate the 1981 values.

The definition of what would have been a cost outlier in 1981 is somewhat imprecise because I had to choose a particular deflator to deflate the 1984 cost outlier threshold to 1981 values. However, there is no reason to believe that a deflator other than the hospital market basket would have changed the amount of difference between hospitals of last resort and other hospitals, and estimating differences between the two types of hospitals in 1981 is the purpose of introducing those data.

Results

Contrary to expectation, the percentage of cases transferred from last-resort hospitals was somewhat higher than the percentage transferred from other hospitals in both PPS1 and PPS2 (Table 2). Also contrary to expectation, patients in DRGs with negative accounting profits were less likely to be

Table 2

Percent of transfers of Medicare patients, by type of hospital from which transferred: United States, 1984 and 1985

Year and type of hospital	Percent of transfers out of hospital	Number of cases in sample
1984, PPS year 1		
Last resort	1.4	13,936
Other	1.0	131,560
1985, PPS year 2		
Last resort	1.8	13,640
Other	1.2	129,595

NOTES: PPS year 1 is the first year of implementation of the prospective payment system at the hospital level. For a hospital whose fiscal year begins on Oct. 1, 1983, it is Oct. 1, 1983, through Sept. 30, 1984. For a hospital whose fiscal year begins on July 1, 1984, it is July 1, 1984, through June 30, 1985. PPS year 2 is the second year after implementation (defined similarly). Last-resort hospitals are generally city and county hospitals in cities of 1 million population or more; the remainder of the hospitals in these cities are designated "other." Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

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[2]It is appropriate to use the variance of the cases in the DRG rather than the variance of the mean of the DRG because the former is a measure of the risk faced by the hospital on any individual patient.

Table 3

Logistic regression results for likelihood of transfer of Medicare patients as a function of profitability of diagnosis-related group (DRG), by specification: United States, 1984 and 1985

Year and specification	Coefficient	t-value
1984, PPS year 1		
Profitability as continuous variable:		
Intercept	-4.53	-119
Profitability of DRG in 1984 in dollars	.000234	11.7
Dummy variable for positive profit:		
Intercept	-7.02	-18.6
Variable = 1 if profitability positive	2.61	6.9
1985, PPS year 2		
Profitability as continuous variable:		
Intercept	-4.27	-112
Profitability of DRG in 1984 in dollars	.000111	5.1
Dummy variable for positive profit:		
Intercept	-6.18	-18.9
Variable = 1 if profitability positive	1.97	6.0

NOTES: The dependent variable is a dummy variable for discharge to a short-stay hospital (transfer). PPS year 1 is the first year of implementation of the prospective payment system at the hospital level. For a hospital whose fiscal year begins on Oct. 1, 1983, it is Oct. 1, 1983, through Sept. 30, 1984. For a hospital whose fiscal year begins on July 1, 1984, it is July 1, 1984, through June 30, 1985. PPS year 2 is the second year after implementation (defined similarly). Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

transferred than patients in other DRGs in both PPS1 and PPS2 (Table 3). Thus, transfer behavior provides no support for the existence of selection. It is possible, of course, that these patterns predated PPS. Indeed, with the initiation of PPS, the figures may have changed in the expected direction. As explained

in "Methods," however, that hypothesis cannot be tested because data on transfers in 1981 are lacking.

The cumulative distribution of cases at hospitals of last resort, when ranked by profitability of the case (from low to high), did lie above the same distribution for other hospitals, something suggestive of selection (result not shown). Nonetheless, using a Wilcoxon test, one cannot reject the null hypothesis of no difference at conventional confidence levels; the probability of the test statistic generated from the sample was 0.26 for the PPS1 data and 0.13 for the PPS2 data.

This test applies to the entire distribution, but it is perhaps more informative to look at the extreme left tail, i.e., cases in DRGs with negative accounting profits. When one does so, differences between the two types of hospitals appear. In PPS1, 2.2 percent of the cases in last-resort hospitals in cities of 1 million or more were for unprofitable DRGs (Table 4). In contrast, only 1.9 percent of the cases in voluntary and proprietary hospitals in those cities were for these DRGs. One can reject at the 5-percent level the null hypothesis that the true percentages are the same and that this difference arose solely from chance.

Of course, these particular DRGs may, for some reason, have been concentrated at hospitals of last resort even before PPS began. In fact, however, the opposite was the case in 1981, as demonstrated in the four rightmost columns of Table 4. In 1981, cases in unprofitable DRGs were a lower fraction of the caseload in hospitals of last resort than in other hospitals. Thus, controlling for the distribution of patients in 1981 causes the difference between the two types of hospitals to widen. There was a swing of one-half of 1 percent of cases in unprofitable DRGs, or about one-quarter of all such cases, toward last-resort hospitals. One can reject the null hypothesis that the swing was zero at the 1-percent level.

Table 4

Percent of Medicare patients in unprofitable diagnosis-related groups, by type of hospital and measure of unprofitability: United States, 1981 and 1984

Measure of unprofitability	1984, PPS year 1				1981			
	Last-resort hospitals	Other hospitals	Difference[1]	Z-statistic[2]	Last-resort hospitals	Other hospitals	Difference of difference[1]	Z-statistic[2]
	Percent				Percent			
All unprofitable cases	2.196	1.912	0.284	2.19	1.349	1.526	0.461	2.76
Mean loss per case of more than $100	1.234	1.031	0.203	2.08	0.730	0.773	0.246	1.98
Mean loss per case of more than $200	0.445	0.362	0.083	1.41	0.214	0.204	0.073	1.03
Number of cases	13,935	131,560	—	—	13,569	125,523	—	—

[1]Calculated as shown in following examples: 0.284 = 2.196 - 1.912; 0.461 = (2.196 - 1.912) - (1.349 - 1.526).

[2]Result of test of null hypothesis that the difference and the difference of difference are zero using the normal approximation to the binomial. Under the null hypothesis, a value of 1.96 or greater would arise by chance only 5 percent of the time; a statistic of 2.57 or greater would arise only 1 percent of the time (2-tailed tests).

NOTES: PPS year 1 is the first year of implementation of the prospective payment system at the hospital level. For a hospital whose fiscal year begins on Oct. 1, 1983, it is Oct. 1, 1983, through Sept. 30, 1984. For a hospital whose fiscal year begins on July 1, 1984, it is July 1, 1984, through June 30, 1985. PPS year 2 is the second year after implementation (defined similarly). Last-resort hospitals are generally city and county hospitals in cities of 1 million population or more; the remainder of the hospitals in these cities are designated "other." Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

Table 5

Percent of Medicare patients in unprofitable diagnosis-related groups, by type of hospital and measure of unprofitability: United States, 1985

Measure of unprofitability	Last-resort hospitals	Other hospitals	Difference[1]	Z-statistic[2]	Difference of difference[3]	Z-statistic
	Percent				Percent	
All unprofitable cases	2.265	2.055	0.210	1.58	0.387	2.28
Mean loss per case of more than $100	1.100	1.169	−0.069	—	−0.026	—
Mean loss per case of more than $200	0.447	.0.421	−0.026	—	−0.036	—

[1]Calculated as shown in following example: 0.210 = 2.265 − 2.055.
[2]Result of test of null hypothesis that the difference and the difference of difference are zero using the normal approximation to the binomial. Under the null hypothesis, a value of 1.96 or greater would arise by chance only 5 percent of the time; a statistic of 2.57 or greater would arise only 1 percent of the time (2-tailed tests).
[3]Using 1981 as control. Calculated as shown in following example: 0.387 ≈ (2.265 − 2.055) − (1.349 − 1.526).

NOTES: Last-resort hospitals are generally city and county hospitals in cities of 1 million population or more; the remainder of the hospitals in these cities are designated "other." Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

Moreover, these tests of significance are conservative, because they are two-tailed, whereas a one-tailed test could easily by justified.

As previously emphasized, zero accounting profit does not necessarily mean zero economic profit. I therefore used two more extreme definitions of negative accounting profit to test the hypothesis that patients in unprofitable DRGs are found disproportionately in hospitals of last resort: These were DRGs with a mean accounting loss of more than $100 and more than $200. The results for PPS1 using these alternative definitions are similar to those using all unprofitable DRGs, although there are so few cases in DRGs with an average accounting loss of more than $200 that the results are relatively imprecise.

If one repeats this test with PPS2 data, the results are not as precise (Table 5). Cases with negative profits continue to form a higher proportion of cases at hospitals of last resort. Considering only 1985, one cannot reject the null hypothesis of no difference at usual levels of confidence ($Z = 1.58$). However, if one controls for 1981 (that is, looks at the difference of the differences), one can reject the null hypothesis at the 5-percent level. The picture changes for DRGs with losses of more than $100 and more than $200, however; for cases falling below those points, the proportion of cases in last-resort hospitals is actually less than the proportion in other hospitals, even controlling for 1981 experience.

The PPS2 results indicate that one should have less confidence in the PPS1 results, although how much less is problematic for two reasons. First, the PPS2 results were calculated using PPS1 accounting profits. Because of coding changes, the mix of cases by DRG almost certainly was different in PPS2. Hence, expected profits by DRG would be different in PPS2. In effect, the measure of profitability used in PPS2 analysis contains random error. Because of this random error, the test for PPS2 is less powerful than the test for PPS1. Second, the results that differ from the PPS1 results are for the sample of cases in DRGs with more than $100 and more than $200 accounting

losses. This is the far left tail of the distribution. Only slightly more than 1 percent of the cases are in DRGs with accounting losses of more than $100, and fewer than 0.5 percent are in DRGs with accounting losses of more than $200. Put another way, the sample contained only 61 cases in hospitals of last resort that fell in DRGs with an accounting loss of $200 or more. Hence, the differing results may simply be a small-sample problem.

In a different test, the DRG was used as the unit of observation. If cases were allocated randomly between hospitals of last resort and other hospitals, one would expect differences in the proportion of total cases at a given hospital type that are in any given DRG to be unrelated to mean profit or to the variance within a DRG. On the other hand, if there were selection, the difference in the proportion of cases in hospitals of last resort and cases in other hospitals would be negatively related to mean profit and positively related to variance; that is, an unprofitable DRG would form a higher proportion of total cases at hospitals of last resort.

This test also yields results that are suggestive of dumping in both PPS1 and PPS2 (Table 6). During PPS1, the share of DRGs with negative accounting profits was, on average, about 0.14 percentage points larger at hospitals of last resort than at other hospitals. One can reject the null hypothesis that the true difference is zero at the 1-percent level. Controlling for expected profitability and the difference between the two types of hospitals in their shares by DRG in 1981, higher variance DRGs were more likely to be found in other hospitals. This result is contrary to expectation, but the coefficient is not significant at conventional levels in PPS1.

The results are remarkedly similar using data from PPS2. Controlling for the differences between the two types of hospitals in the share of cases in 1981, DRGs with negative accounting profits had a share at hospitals of last resort that was 0.13 percentage points larger than the share at other hospitals. For PPS2 then, as for PPS1, one can reject the null hypothesis that the two types of DRGs are distributed similarly

Table 6

Difference between last-resort and other hospitals in share of hospital Medicare caseload made up of patients in unprofitable diagnosis-related groups (DRGs): United States, 1984 and 1985

Year and variable	Coefficient	t
1984, PPS year 1[1]		
Intercept	0.0023	5.45
Difference in shares in 1981	0.74	5.25
Variable = 1 if 1984 profits < 0; otherwise = 0	0.0014	3.31
Variance of profit in 1984	-4.1×10^{-11}	-0.44
1985, PPS year 2[2]		
Intercept	0.0024	9.16
Difference in shares in 1981	0.68	5.02
Variable = 1 if 1984 profits < 0; otherwise = 0	0.0013	4.02
Variance of profit in 1984	-4.1×10^{-11}	-2.05

[1]The estimated equation is based on 35 DRGs with 100 cases or more in last-resort hospitals in PPS year 1. Observations are weighted by [(N84LR) (N84NLR)]/[(N84LR) (p(NLR)) (1 - p(NLR)) + (N84NLR) (p(LR)) (1 - p(LR))], where N84LR is the number of cases in PPS year 1 in last-resort hospitals, N84NLR is the number of cases in PPS year 1 in other hospitals, p(LR) is the share of cases in last-resort hospitals, and p(NLR) is the share of cases in other hospitals.

[2]The regression is based on 33 DRGs with 100 cases or more in last-resort hospitals in PPS year 2. The weight is based on an analogous formula to that used for PPS year 1, outlined in footnote 1.

NOTES: Dependent variable is share of total cases in DRG(i) in last-resort hospitals − share of total cases in DRG(i) in other hospitals during the year. Only DRGs with 100 cases or more in last-resort hospitals during the year are included. PPS year 1 is the first year of implementation of the prospective payment system at the hospital level. For a hospital whose fiscal year begins on Oct. 1, 1983, it is Oct. 1, 1983, through Sept. 30, 1984. For a hospital whose fiscal year begins on July 1, 1984, it is July 1, 1984, through June 30, 1985. PPS year 2 is the second year after implementation (defined similarly). Last-resort hospitals are generally city and county hospitals in cities of 1 million population or more; the remainder of the hospitals in these cities are designated "other." Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

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between the two types of hospitals at well under the 1-percent level.

Also, as in PPS1, DRGs with large variance were less likely to make up a large share of the caseload at hospitals of last resort than at other hospitals. The quantitative effect is, however, small. The mean of the variance in profitability across DRGs is on the order of exp(8); the coefficient of the variance variable is on the order of exp(−11). Hence, a 1-percent increase in variance changes the share differential only on the order of exp(−3). Thus, the effect of a 1-percent change in variance is in the tenths of a percentage point. Nonetheless, one can reject the null hypothesis that variance has no effect at the 5-percent level.

Finally, I examined the distribution of outlier cases across hospitals. If there were selection, one might expect more outlier cases in hospitals of last resort. However, one finds just the opposite. As shown in Table 7, there are fewer outlier cases in such hospitals. This table contains results from the entire sample as well as from DRGs with 100 cases or more in hospitals of last resort in PPS1.

Table 7

Percent of total Medicare cases that are outlier cases, by type of diagnosis-related group (DRG) and type of hospital: United States, 1981, 1984, and 1985

Type of DRG and type of hospital	1981	1984, PPS year 1	1985, PPS year 2
All DRGs[1]			
Last resort	8.2	2.2	2.4
Other	6.4	2.5	2.9
DRGs with 100 cases or more in last-resort hospitals[2]			
Last resort	6.1	2.0	2.0
Other	8.1	2.6	2.6

[1]Based on 376 DRGs with 13,532 cases in last-resort hospitals in 1981 and 397 DRGs with 125,242 cases for other hospitals in 1981. Numbers for PPS year 1 and PPS year 2 are 13,936 and 13,640, respectively, for last-resort hospitals and 131,560 and 129,595, respectively, for other hospitals.

[2]In the relevant year. Sample size for 1981 is 6,271 in last-resort hospitals and 58,485 in other hospitals.

NOTES: PPS year 1 is the first year of implementation of the prospective payment system at the hospital level. For a hospital whose fiscal year begins on Oct. 1, 1983, it is Oct. 1, 1983, through Sept. 30, 1984. For a hospital whose fiscal year begins on July 1, 1984, it is July 1, 1984, through June 30, 1985. PPS year 2 is the second year after implementation (defined similarly). Last-resort hospitals are generally city and county hospitals in cities of 1 million population or more; the remainder of the hospitals in these cities are designated "other." Data from waiver States are excluded. Figures are based on a 5-percent sample of cases.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review (MEDPAR) file and Medicare cost reports.

Moreover, the finding of fewer outlier patients in last-resort hospitals is strengthened by looking at 1981 data; there were more such patients in last-resort hospitals in 1981. As explained in "Methods," the absolute level of the 1981 values should not be taken too literally. However, there is little reason to expect that the comparison of the frequency of outliers at the two types of hospitals would be biased.

Discussion

In this article, I present three types of tests of whether hospitals and their medical staffs engage in behavior commonly known as skimming and dumping—that is, whether they attempt to select Medicare patients based on their expected profitability. In all tests, patients at city or county hospitals in cities of 1 million or more (hospitals of last resort) were compared with patients at other hospitals in those same cities.

Two types of tests were based on the variation in the mean profitability of various DRGs. In principle, profits were not supposed to vary by DRG. In fact, however, they did, because patients were coded in different DRGs than they were when the DRG weights were computed. Additionally, technological or behavioral change might differ by DRG, causing, for example, a greater decline in length of stay in some DRGs than in others. Implicit in the hypothesis of selection is the idea that unprofitable DRGs are more

likely to be found in hospitals of last resort. On the whole, this hypothesis was supported. The left tail of the distribution of cases by profitability, where mean profitability is negative, was thicker at hospitals of last resort than at other hospitals, especially in the first year of PPS. Additionally, when one computes the difference between hospitals of last resort and other hospitals in the share of each DRG in the hospital's total caseload, the difference is negatively related to the profitability of the DRG. Put another way, the less profitable the DRG was, the larger was its share of admissions in hospitals of last resort when compared with other hospitals. This result controls for the difference in shares in 1981 and was found in both PPS1 and PPS2. The finding of differences in the place of treatment between DRGs with negative and positive accounting profits gives some support for the methodological conclusion that accounting profits are correlated with marginal economic profits.

The cumulative distribution of cases at hospitals of last resort, when ranked by profitability, was above the cumulative distribution at other hospitals, but the difference was not significant at conventional levels in either PPS1 or PPS2 using a Wilcoxon test. This may not be a powerful test, however, because equal weight is given to all parts of the distribution. With hospitals generally having excess capacity, a hospital would not have wanted to transfer a patient on whom it would have made, say, $1,000 in order to make room for a patient on whom it would have made $2,000. Even with excess capacity, however, a hospital would have had a fiscal incentive to not admit a patient on whom it would have lost money. Hence, it is reasonable to give greater weight to the findings in which behavior in the far left tail of the distribution, the unprofitable DRGs, is emphasized.

Although the results just cited generally support the finding of selection, others do not. Patients in hospitals of last resort were more likely to be transferred out than patients in other hospitals were. Furthermore, in both PPS1 and PPS2, the likelihood of a transfer was positively related to the profitability of a DRG. Even considering only the left tail, patients in unprofitable DRGs were less likely to be transferred. These results do not control for behavior before PPS. However, if there were no preexisting differential, one can infer that the review of all transfer cases by peer review organizations is effective in keeping transfers for economic reasons at minimal levels. Of course, the observed differential may have existed in 1981 and may have been medically appropriate.

A final test of selection was based on the distribution of outlier cases, which are almost always unprofitable. The hypothesis that outlier cases form a higher proportion of cases at hospitals of last resort than at other hospitals was not supported. Outlier cases form a lower proportion of cases within a DRG at hospitals of last resort, even controlling for the distribution of cases in 1981. This may reflect an absence of dumping or may reflect difficulty in identifying at admission cases that are likely to become outliers.

Thus, the evidence of selection is mixed, but there are some grounds for concern. Relative to 1981, a greater share of patients in hospitals of last resort were in DRGs with negative mean profits than was the case in other hospitals (Table 4). Although the excess share in last-resort hospitals, 0.5 percent, may seem small, two facts should be kept in mind. First, because of reviews of transfers and resistance by hospitals to accepting patients who generate losses, overt selection was probably difficult to accomplish. Second, only about 2 percent of all patients were in DRGs with negative accounting profits; thus, about one-quarter of such patients were being treated in different hospitals in 1984. Moreover, close to one-half of the patients within these DRGs were profitable, even though the average patient was unprofitable. There would have been no financial incentive to shift the profitable patients, making the 0.5-percent figure loom even larger.

On the other hand, the findings with respect to transfers and outliers did not support the existence of selection. Taking these results together, I conclude that selection is a matter that will continue to bear scrutiny, but the evidence is as yet too weak to conclude that it is a serious problem.

Acknowledgments

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