NBER WORKING PAPER SERIES

CASE MIX, COSTS, AND OUTCOMES: DIFFERENCES BETWEEN FACULTY AND COMMUNITY SERVICES IN A UNIVERSITY HOSPITAL

Victor R. Fuchs

Alan M. Garber

James F. Silverman

Working Paper No. 1159

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

June 1983

We are grateful to Byron Wm. Brown, Jr., for advice on statistical methods and to Judy Anderson and Leslie Perreault for research assistance. Financial support was provided by a grant from The Rodert Wood Johnson Foundation to the National Bureau of Economic Research. The research reported here is part of the NBER's research program in Health Economics. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #1159
June 1983

Abstract

CASE MIX, COSTS, AND OUTCOMES: DIFFERENCES BETWEEN FACULTY AND COMMUNITY SERVICES IN A UNIVERSITY HOSPITAL

In order to gain insight into the possible consequences of prospective payment for university hospitals, we studied 2,025 admissions to the faculty and community services of a university hospital, measuring differences in case mix, costs, and outcomes. The faculty service case mix was disproportionately weighted toward the more costly diagnoses, but even after adjustment for diagnosis-related groups (DRGs), costs were 11 percent higher on the faculty service. The differential was proportionately greater for diagnostic costs than for routine or treatment costs, and the differential was particularly large (70 percent) for patients with a predicted probability of death (DTHRISK) of .25 or greater.

The in-hospital mortality rate was appreciably lower on the faculty service after adjustment for case mix and patient characteristics. The mortality differential between the two services was particularly large for patients in the high death risk category.

Comparison of a matched sample of 51 pairs of admissions from the high death risk category confirmed the above results with respect to costs and in-hospital mortality, but follow-up revealed that the mortality rates were equal for the two services at nine months after discharge.

Victor R. Fuchs
National Bureau of Economic Research
204 Junipero Serra Boulevard
Stanford, CA 94305

415/326-7639

Introduction

Prospective payment is a cornerstone of federal and state plans to control health care costs.[1] It is also perceived as a threat to the financial viability of academic medical centers, whose costs per admission exceed those of community hospitals.[2,3] Many investigators attribute higher costs to the distinctive mix of patients cared for in teaching hospitals.[4] These patients undergo extensive diagnostic investigation, receive more aggressive treatment, and stay in the hospital longer, in part because they often present with more complex problems than their counterparts in nonteaching hospitals. Each hospital's case mix changes little from year to year.[5] If academic medical centers continue to serve patients like those they have admitted in the past, and provide them with the same level of care, their revenues will depend upon the case mix adjustment applied to prospective payment.

The case mix measure that will be applied under Medicare, Diagnosis Related Groups (DRGs), is already in use in Maryland and New Jersey.[6] DRGs are groupings of ICD-9CM diagnostic categories modified by major surgical procedures, patient age, and the presence of significant complications or concurrent illnesses.[7] Currently there are 467 DRGs, chosen to minimize the variance in costs within each group.[8] For some diagnoses, patients are assigned to one category if hospitalization terminates in death, and to another if they survive. Thus DRGs, like several other case mix measures, reflect events and procedures during hospitalization in addition to patient characteristics at admission. They do not measure health improvement or hospital output defined in precise terms.

Teaching hospitals anticipating DRG-based payment schedules will find little reassurance from previous studies of the relation between hospital costs and case mix. These studies showed that teaching hospitals have higher costs even when case mix is held constant.[3,9,10] There has been little discussion of the contribution, if any, of higher costs to better patient outcomes. Both policy makers and the hospitals need to know the causes of these cost differences and their implications. We explore these issues by comparing patients admitted to the faculty and community services of a major university-affiliated hospital, measuring the contribution of case mix and other patient characteristics to differences in costs between the faculty and community services. We identify subsets of patients with particularly large cost differences and explore their potential causes. Finally, we investigate whether higher expenditures are associated with differences in outcomes, and discuss the implications for hospital costs and performance under prospective payment. By studying differences within a single hospital, we implicitly hold constant wage rates, costs of materials and supplies, laboratory fees, pharmacy prices, quantity and quality of nursing, and similar factors that confound comparisons between different hospitals.

Data and Methods

A. Sample and Data Base

The basic population consisted of all admissions of patients aged 45 and over to a major university-affiliated hospital during 1981. The sample was limited to admissions that fell into diagnosis-related groups meeting these criteria: (1) at least 20 admissions to each of the faculty and community services; and (2) 10 or more deaths in the DRG in 1981. The second criterion ensured adequate variation in outcomes for the purposes of analysis. The type of attending physician determined whether an admission was counted as a faculty or a community patient. House officers participated in the care of 33 percent of the community patients (community teaching service) and all of the faculty patients. Usually faculty patients received care in distinct areas of the hospital. The 43 admissions that lacked a specification of physician type were excluded, to leave a final sample of 1,007 faculty and 1,018 community admissions in 12 DRGs. These DRGs accounted for 16.2 percent of all admissions and 29.5 percent of all costs of patients 45 and over. The data were generated from a data base known as the "Care Monitoring System." This system utilizes medical record discharge data, including patient demographics, physician activity, outcomes, diagnoses, and procedures. The data are classified by DRG and the medical record data are merged with the financial record which assigns charges by service unit. For this study, charges were assigned in three categories: routine (including room and central service), diagnostic, and therapeutic.

B. Predicting Hospital Outcome

The method of maximum likelihood was used to estimate a multiple logistic equation relating the probability of death during hospitalization to a number of personal characteristics. The dependent variable took the value of one if admission terminated in death, and zero otherwise. Independent variables were age and dummy variables for sex, urgency of admission, race, area of residence, previous discharge, and each of the 12 DRGs. A predicted probability of death (DTHRISK) was computed for each patient by applying the estimated logistic equation to the values of the variables for the patient.

C. Cost and Outcome Adjustment

We determined the contribution of patient mix to observed differences in costs and outcomes by adjusting for DRG alone and for DRGs with personal characteristics. These adjustments are analogous to indirect age adjustments. To adjust costs for DRGs and other characteristics, we first derived a measure of predicted costs. In the first stage linear regressions were estimated with the natural logarithm of costs as the dependent variable and the following as exogenous variables: dummy variables for sex, religion, type of insurance, urgency of admission, race, location of residence, previous discharge, age category, and DRG. To adjust for DRG alone we performed similar regressions, omitting the other variables. The regression coefficients were then applied to obtain predicted cost for each admission. The geometric means of the ratio of actual to predicted costs (i.e., adjusted cost ratios) were computed for the faculty and the community patients separately. Finally, the adjusted cost was calculated as the adjusted cost ratio for faculty (or community) multiplied by the mean costs for both groups combined. The formula for adjusted costs for the faculty was:

$$\text{Adj. costs} = \exp\left[\sum_{i=1}^{NFAC} \frac{\log C_i - \log \hat{C}_i}{NFAC}\right] (\bar{C}),$$

where C_i are the actual costs for the ith faculty patient, $\hat{C_i}$ are that patient's predicted costs, $\bar{C}$ is the mean cost for faculty and community patients combined, and NFAC is the total number of faculty patients in the group.

Outcomes were adjusted in an analogous manner. To obtain the predicted risk of death for an individual, adjusting for personal characteristics as well as DRGs, we used the predicted value of DTHRISK for that patient. The adjusted risk ratio for any group of patients was defined as the proportion of the group that actually died divided by the mean predicted death risk for the group. The adjusted risk was simply the adjusted risk ratio for either a community or faculty group multiplied by the percentage of the combined population that died.

D. Sample of Matched Observations

A sample of matched community and faculty patients was selected for chart review. All patients whose predicted probability of death (DTHRISK) was equal to or greater than .25 were identified. This included 60 faculty and 140 community patients. Faculty/community pairs were then matched by age, sex, and DRG. Close matches were found for 55 pairs of patients, but 4 pairs were excluded because medical records could not be located for one member of the pair. The remaining 51 pairs were compared for costs and outcomes, their medical charts were reviewed, and their status during the year following discharge was ascertained.

Results

Patients admitted to the faculty and community services differed in several important respects, as may be seen in Table 1. The former were much more likely to be admitted for cardiac surgery or treatment for lymphoma or leukemia. A disproportionate number of patients on the community service had diagnoses of cerebrovascular disorders, chronic obstructive pulmonary disease, or heart failure and shock. The faculty service patients were substantially younger (seven years difference, on average), less likely to be admitted on an emergency basis, and much less likely to live within one-half hour's drive of the hospital. The distributions (not shown in the table) of patients by race, religion and insurance coverage were similar in the two services except that those on the community side had a larger percentage of Medicare patients, reflecting the difference in age distribution.

Table 2 shows that the large cost difference between faculty and community patients (59.6 percent) was substantially reduced (to 10.8 percent) when costs were adjusted for differences in the distribution of cases across the 12 DRGs. Additional adjustment for the socioeconomic characteristics of the patients had virtually no effect (less than one percentage point) on the overall cost differential of over $1,200 per case. Similarly, exclusion of 16 outliers (costs in excess of $100,000) had very little effect on the differential. Costs are based on patient charges rather than the actual value of resources used. Because the ratio of costs to charges varies by type of charge, differences in charges may either overestimate or under-estimate cost differences if the distribution of charges by type varies greatly between the faculty and community services. There is some tendency for a greater proportion of faculty charges to be for diagnostic services,

TABLE 1. Distribution of admissions by DRG, patient characteristics, and type of physician.

	Faculty	Community
Number of admissions	1007	1018
Percent distribution by:		
DRG		
014 Cerebrovascular Disorders	4.6	15.3
082 Respiratory Neoplasms	6.1	6.9
087 Pulmonary Edema & Respiratory Failure	2.0	2.3
088 Chronic Obstructive Pulmonary Disease	5.0	10.8
089 Simple Pneumonia	2.6	6.2
105 Cardiac Valve Procedure	19.2	5.7
107 Coronary Bypass	37.2	23.2
127 Heart Failure & Shock	4.9	14.8
172 Digestive Malignancy	2.5	4.0
203 Pancreatic or Hepatobiliary Malignancy	2.4	2.8
274 Malignant Breast Disorders	2.7	2.9
403 Lymphoma or Leukemia	11.0	5.0
Emergency Status		
Elective	5.1	3.6
Urgent	54.9	28.2
Emergent	40.0	68.2
Discharge Within Last Six Months		
Yes	18.6	22.5
No	81.4	77.5
Residence[a/]		
Less than 30 minutes	12.4	55.3
31-60 minutes	20.2	14.5
61-120 minutes	27.7	18.6
121 minutes or more	38.0	6.7
Unknown	1.7	4.9

Table 1, concluded

	Faculty	Community
Percent distribution by:		
<u>Sex</u>		
Female	34.9	46.6
Male	65.1	53.4
<u>Age</u>		
45-64	57.6	34.7
65-74	31.5	31.2
75 and over	10.9	34.1

[a]/Approximate travel time to hospital.

TABLE 2. Cost per admission by type of physician.

DRG		Total	Faculty	Community	Faculty-Community Differential[a/]
		($)	($)	($)	(%)
014	Cerebrovascular Disorders	5,829	9,097	4,865	87.0
082	Respiratory Neoplasms	4,828	5,274	4,439	18.8
087	Pulmonary Edema & Respiratory Failure	8,939	13,688	4,903	179.2
088	Chronic Obstructive Pulmonary Disease	7,956	8,872	7,539	17.7
089	Simple Pneumonia	8,160	7,630	8,379	-8.9
105	Cardiac Valve Procedure	24,562	25,054	22,924	9.3
107	Coronary Bypass	18,740	19,159	18,075	6.0
127	Heart Failure & Shock	4,560	5,163	4,364	18.3
172	Digestive Malignancy	5,838	7,684	4,713	63.0
203	Pancreatic or Hepatobiliary Malignancy	4,955	5,846	4,217	38.6
274	Malignant Breast Disorders	4,166	4,063	4,259	-4.6
403	Lymphoma or Leukemia	9,732	9,452	10,341	-8.6
Average cost of 12 DRGs		12,437	15,313	9,592	59.6
Cost adjusted for DRG mix		12,437	13,096	11,815	10.8

[a/] (Faculty - Community) ÷ Community.

which have a lower cost/charge ratio, but the bias introduced by the use of charges was less than one percent for the average DRG and less than one-tenth of one percent for the 51 matched pairs comparison discussed below.

Patients were allocated to four risk categories, based on their predicted probability of death. These categories corresponded to values of DTHRISK $\geq$ .25 (9.9 percent of the admissions), between .15 and .24 (22.9 percent), between .05 and .14 (27.6 percent), and less than .05 (39.6 percent). Table 3 shows that the cost differential was largest among the high-risk patients--those who, at the time of admission, had an estimated probability of death of .25 or greater. For such patients, those treated by faculty had costs that were 70 percent greater than those treated by community physicians, after adjusting for case mix as measured by DRGs. When costs were disaggregated into three major categories, the adjusted percentage differential was greatest for diagnostic costs and smallest for routine costs.

Faculty service patients experienced higher costs, but Table 4 shows that they also enjoyed better outcomes as measured by deaths per hundred admissions. Even after adjusting for DRGs and socioeconomic characteristics, the community service patients were 34 percent more likely to be dead at discharge (12.3 versus 9.2 deaths per hundred). Disaggregation by DTHRISK shows that the outcome difference was most pronounced for the high-risk patients, the same ones that showed the largest differential in costs.

Analysis of the relation between the cost and mortality differentials reveals substantial differences across the 12 DRGs. In one set (089, 105, 107, 274, and 403) there was a large mortality differential and virtually

TABLE 3. Adjusted[a] costs by type of cost, DTHRISK, and type of physician.

		DTHRISK[b]				
		<.05	.05-.14	.15-.24	≥.25	All
Total:	Faculty	17,781	12,081	7,955	7,976	13,096
	Community	17,048	10,449	7,103	4,697	11,815
Diagnostic:	Faculty	3,613	3,408	2,044	1,757	2,985
	Community	3,353	2,506	1,603	843	2,420
Routine:	Faculty	9,328	6,131	4,204	4,815	6,795
	Community	9,135	5,495	4,285	3,089	6,529
Treatment:	Faculty	4,591	2,697	1,560	1,803	3,209
	Community	4,391	2,386	1,404	973	2,993
Faculty-community differential[c] (Percent)						
Total		4.3	15.6	12.0	69.8	10.8
Diagnostic		7.8	36.0	27.5	108.4	23.3
Routine		2.1	11.6	-1.9	55.9	4.1
Treatment		4.6	13.0	11.1	85.3	7.2

[a] Adjusted for DRG mix.

[b] Probability of death estimated with a logistic regression.

[c] 100 × (faculty - community) ÷ community.

TABLE 4. Deaths per 100 admissions by DTHRISK and type of physician.

		DTHRISK[a]				
		<.05	.05-.14	.15-.24	≥.25	All
Unadjusted:	Faculty	2.0	8.8	16.1	23.3	7.2
	Community	3.8	9.7	21.4	34.3	14.9
Adjusted for DRG and other characteristics[b]:	Faculty	2.1	8.8	16.2	22.8	9.2
	Community	4.5	9.6	20.9	34.6	12.3

[a]Probability of death estimated with a logistic regression.

[b]Urgency of admission, age, sex, race, residence, and discharge previous 6 months.

no difference in cost. In a second set (082, 172, and 203) there were large differentials in both costs and mortality. And in a third set (014, 087, 088, and 127) there was a large cost differential, but adjusted mortality was actually slightly higher on the faculty service. Interestingly, the allocation of patients by service and DRG appears to be responsive to these cost-mortality tradeoffs. For the first set of DRGs, where the faculty service had substantially lower mortality with no increase in cost, this service accounted for 63 percent of the admissions. By contrast, for the third set of DRGs, where the faculty service had substantially higher costs without lower mortality, only 27 percent of the patients were treated by faculty physicians. For the intermediate set of DRGs, admissions were more equally divided, with 44 percent cared for on the faculty service.

The results of a comparison of matched observations reported in Table 5 strongly support the conclusions drawn from the larger sample and offer additional insights concerning the differences between the two services. The 51 admissions to the faculty service were matched by DRG, age, and sex with 51 admissions to the community service. The patients came from the following DRGs (number of pairs shown in parentheses): 014 (5), 082 (16), 087 (5), 172 (4), 203 (14), and 274 (7). All patients had a death risk $\geq .25$. Within this matched group the average cost was more than twice as high in the faculty service. Moreover, this large difference was not attributable to a few large outliers. In 41 of the 51 pairs, the patient on the faculty service had the higher costs. The difference in outcomes, as measured by status at discharge, was also substantial: the death rate was almost twice as high among patients on the community service.

Although these patients had been carefully matched by several criteria, review of their medical charts revealed a large difference in the proportion who had "do not resuscitate" (DNR) notation on their charts. Only six of the 51 admissions to the faculty service had DNR compared with 26 on the community service. This could reflect objective differences in the medical condition of the patients that were not accounted for by DRG, age, sex, and DTHRISK, or could reflect subjective differences in patient or physician attitudes. Also, the low use of DNR on the faculty service may result from administrative difficulties faced by house officers who must obtain approval from the faculty supervisor in order to put this notation on the chart. The difference in code status is large, but it does not explain the differences in costs and outcomes. For 23 pairs where the faculty and community patients had the same code status (21 were "resuscitate"), the faculty-community differentials were similar to those for all the pairs. Among the 23 pairs, 19 of the faculty service patients had higher costs.

A much higher percentage of the community service patients were local residents (could drive to the hospital in less than 30 minutes). We were able to match 22 pairs by residence zone (19 were in the "local" zone) but this matching did not reduce the cost differential. Among the 22 pairs, 18 of the faculty service patients had higher costs. The differential in mortality was smaller than for all the pairs, but the faculty service patients still had lower death rates.

There is no doubt that a higher percentage of the patients on the faculty service were discharged alive, but there is considerable interest in knowing how much longer they lived. The last line of Table 5 and Figure 1

TABLE 5. Results of analysis of 51 matched pairs.

	Faculty	Community
Average age	68.7	69.7
Average DTHRISK	31.9%	32.8%
Cost per admission	$8,809	$3,132
Dead at discharge	27.5%	49.0%
"Do not resuscitate" (DNR) code	11.8%	51.0%
Local residence	41.2%	76.5%
Matched by code status (23 pairs)		
Cost per admission	$10,756	$3,722
DTHRISK	30.2%	30.4%
Dead at discharge	17.4%	34.8%
Matched by residence (22 pairs)		
Cost per admission	$11,476	$3,570
DTHRISK	29.9%	29.8%
Dead at discharge	31.8%	40.9%
Survived at least one year (48 matched pairs)	16.7%	16.7%

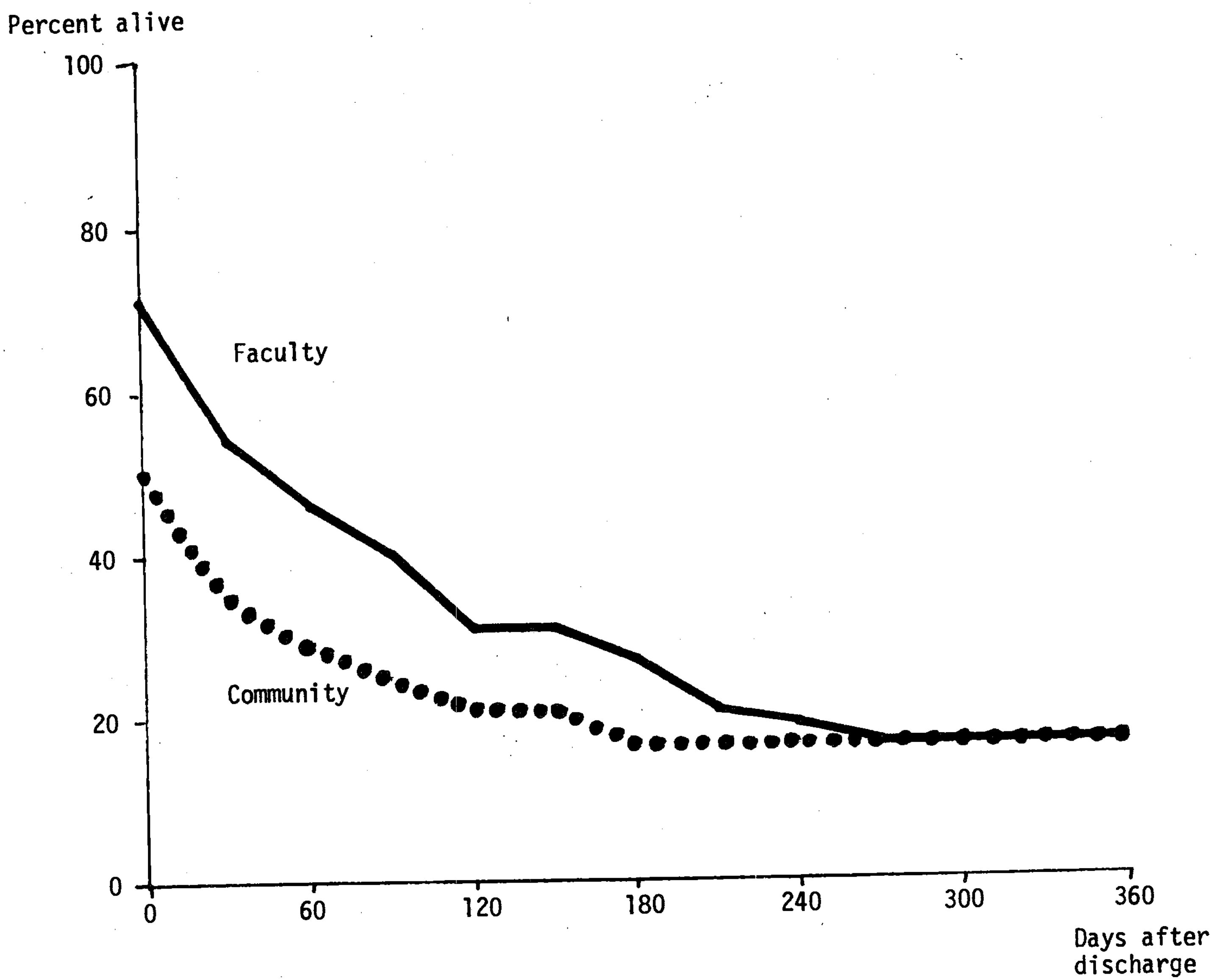

Figure 1. One-year survival curves for 48 matched pairs.

provide answers to that question. For 48 pairs it was possible to ascertain whether the patient lived for at least one year after discharge or, if not, what the date of death was. The percentage surviving one year was quite low, and equal for the two services. Figure 1 shows that there was still considerable difference in survival rates six months after discharge, but by nine months the difference between the two services had disappeared.

Assuming equality in survival from nine months on, we find that the 48 faculty patients lived a total of 56 months longer than the community service patients from day of admission. The differential in total costs for the 48 pairs was $264,960. Thus, assuming that the longer survival was attributable to the greater expenditure, the average cost of an additional month of life was $4,698.

Discussion

Our study, like studies comparing community and teaching hospitals,[9,10] found that adjustment for case mix eliminated much of the faculty-community cost differential in this hospital. Nevertheless, admissions to the faculty service generated higher costs within DRGs that could not be explained by other observed patient characteristics. These higher costs were accompanied by lower hospital mortality. Both cost and outcome differences were greatest for the high-risk group of patients.

A number of plausible explanations could be offered for these findings, with distinct and sometimes contradictory implications for health care financing and for the costs of medical education. These may be divided into explanations based on differences in physician attributes and practice patterns, and those based on differences in patient populations.

The differential in adjusted costs probably reflects in part the greater impact on the faculty service of the hospital's role as a training institution and referral center. House officers and medical students have major responsibilities for the care of patients on the faculty service. They play no role for two-thirds of the community service, and even when the community patient is placed in a teaching situation the house staff has less autonomy than on the faculty service. These trainees, who learn by doing procedures and interpreting diagnostic tests, may order such studies more readily because of their putative educational value. The greater use of diagnostic services by trainees may also reflect their unwillingness or inability to rely as heavily as the more seasoned private physicians on the clinical examination.[11]

Physician attitudes toward death may also contribute to the more aggressive care of the faculty service. An unwillingness to allow patients to die may have driven some house officers to press for more care, even when it led to little or no improvement in patient outcome. Private physicians, who knew their patients better, were more aware of the patients' own wishes concerning continued life support. In many cases, the patients' preferences may not have been known to the faculty physicians, who would have treated aggressively when in doubt. Finally, the inexperience of house officers and medical students may have led them to provide some services that had few benefits for the patient.

Physicians on the community service typically cared for patients they had followed for long periods of time prior to hospitalization; thus, they may have been better able to avoid duplication of tests performed outside the hospital and to minimize other costs associated with the work-up of new patients. The patients admitted to the faculty service were unlike community patients in several important ways. Faculty patients fell into higher cost DRG categories and were less frequently admitted under emergent conditions. In addition, detailed chart review suggested that seriously ill patients on the two services differed in less readily quantified dimensions. Community patients, for instance, were more frequently admitted for purely supportive care and less likely to receive extensive diagnostic work-ups or to be admitted to the intensive care unit. Since the severity or stage of illness can vary significantly within the high risk DRGs, control for DRG will not eliminate this source of variation in service intensity. A single DRG can include a patient presenting with a metastasis and an unknown primary tumor requiring extensive diagnostic work-up, as well as a moribund patient admitted for terminal care.

Patient attitudes often contribute to variation in the type and quantity of services provided. Patients suffering the same morbidity and having the same prognosis will not seek the same care if their attitudes toward death and toward medical intervention differ. A patient who is emotionally prepared to die might not consent to intubation, mechanical ventilation, and cardiac resuscitation, though his equally ill peer might desire such measures. The latter patient is more likely to seek admission to a faculty service, with its reputation for aggressive care. The much higher proportion of "no code" (do not resuscitate) orders on the community service probably reflects such patient preferences, in addition to differences in prognosis and physician attitudes.

Many studies of hospital costs have assumed that hospital output could be represented by the volume of services provided.[2] These measures have been justly criticized because inappropriate and ineffective care add to such "output." Patients seek improvements in personal welfare from a hospital, not the tests and treatments themselves; improvement in patient welfare, however, is difficult to measure. Hospital survival is undoubtedly an important component of welfare, and by this criterion, patients on the faculty service did better. In the matched sample of patients for whom follow-up data were available the faculty patients also enjoyed longer out-of-hospital survival. The distribution among DRGs and variation in other patient characteristics could only partially explain their lower mortality rates. Like the cost differentials, the outcomes deviated most for the highest risk group of patients and were likely to reflect differences in practice patterns as well as in the types of patients seen on each service.

The more extensive use of diagnostic procedures and the generally more aggressive care provided on the faculty service may have reduced mortality while generating higher costs. In addition, the patients admitted to the faculty service may not have been as sick as their counterparts on the community service. Just as the patient in an early stage of cancer may receive a more extensive work-up and more aggressive treatment than a patient in the final stages of the same illness, he will also be less likely to die during hospitalization. Because of the preponderance of neoplastic diseases, the variation in disease severity was probably greatest in the high risk categories. The range of diagnostic and therapeutic decisions made at the discretion of the physicians was much greater than for the less risky illnesses. Consequently, cost and outcome differences were greatest for such patients.

Because the patient populations may have differed, these results do not prove that faculty physicians reduced mortality by providing more aggressive care. However, if patients on the faculty service were less likely to die simply because they were better risks, why did the faculty service attract them? It is unlikely that chance alone could cause so significant a disparity in patient populations. One explanation is that community physicians waited longer to admit their patients to the hospital than did their faculty counterparts. By substituting outpatient for inpatient services, they may have increased the proportion of their patients in the final stages of illness while reducing hospital costs. Just as an all-inclusive measure of costs of illness, including out-patient services, may have shown less discrepancy between the faculty and community, better control for stage of illness may have reduced the mortality differential.

Patient perceptions of the difference in practice styles may underlie systematic differences in the faculty and community patient populations. Those patients who desired or were likely to benefit from more aggressive care sought, or were referred to, the faculty. Not only did differences in underlying disease contribute to the mortality differences, but they determined what kind of care was appropriate. Notably, in the DRGs that had mainly faculty patients, the faculty patients had lower mortality than community patients, with similar costs. In the primarily community DRGs, the community patients had lower costs than faculty patients, with similar mortality. It is as if most of the patients were allocated to the service that would provide the best balance of costs and benefits. Neither the faculty nor the community medical practice was necessarily better or worse, merely different. There is no reason to expect or to desire patients with diverse conditions and attitudes to receive the same care or to have the same outcomes.

The differences we observed between the faculty and community services in the <u>same</u> hospital are likely to understate the differences <u>between</u> teaching and community hospitals. In the hospital studied, the same advanced, specialized facilities were available to the faculty and community patients, and house staff participated in the care of some community patients.

Furthermore, faculty and community physicians in this hospital undoubtedly interacted more closely than faculty and community physicians in separate hospitals, contributing to a more homogeneous style of medicine. On the other hand, outcome differences in the 12 DRGs we studied were greater than in other DRGs, which had lower death rates.

It is difficult to ascertain whether the aggressive care on the faculty service contributed to lower hospital mortality, and it is even more difficult to judge whether the reduced mortality was justified by the cost. In the matched sample of seriously ill patients more than half were discharged alive, but less than one-fifth survived for as much as one year. We did not investigate the quality of life for the survivors. Some patients undoubtedly benefited from the heavy utilization of costly resources, but it is difficult to evaluate the tradeoff between costs and outcomes.

Even if the extra costs on the faculty service are attributable to education of house staff and students, without corresponding patient benefits, these activities may be worthwhile. Then it is appropriate not to ask whether such costly care should continue, but whether it should be financed with patient-care revenues. If these services have few educational benefits and little value to the patient, other methods of training physicians should be investigated. But if the aggressive services help some patients while educating house staff, effort should be devoted to identifying the patients most likely to benefit from such care.

Patients who would benefit from aggressive care will suffer the most with implementation of prospective payment. Under prospective payment, hospitals will have incentives to manipulate discharge diagnoses to fit patients into higher payment DRGs, to perform surgical procedures that shift patients to other DRGs, to limit hospital stays, and to minimize daily expenditures.[12] Institutions that continue to practice the high-cost medicine typical of the faculty service will suffer financial penalties. Less aggressive services will become more common. Institutions will face the difficult challenge of both limiting expenditures and continuing to provide aggressive care to those patients for whom it is appropriate. If hospital services become more homogeneous, we may see hospital mortality rise. Policy makers will closely monitor the effects of prospective payment on expenditures; an important potential consequence of prospective payment will be overlooked if they do not also monitor outcomes.

REFERENCES

1. Iglehart JK. The new era of prospective payment for hospitals. N Engl J Med. 1982; 307:1288-92.

2. Sloan FA, Feldman RD, Steinwald AB. Effects of teaching on hospital costs. J Health Econ. Forthcoming.

3. Watts CA, Klastorin TD. The impact of case mix on hospital cost: a comparative analysis. Inquiry 1980; 17:357-67.

4. Ament RP, Kobrinski EJ, Wood WR. Case mix complexity differences between teaching and nonteaching hospitals. J Medical Educa. 1981; 56:894-903.

5. Lave JR, Lave LB. The extent of role differentiation among hospitals. Health Serv Res. 1971; 6:15-38.

6. Iglehart JK. Medicare begins prospective payment of hospitals. N Engl J Med. 1983; 308:1428-32.

7. Hornbrook MC. Hospital case mix: its definition, measurement and use: Part II. Review of alternative measures. Med Care Rev. 1982; 39:73-123.

8. Thompson JD, Fetter RB, Mross CD. Case mix and resource use. Inquiry 1975; 12:300-12.

9. Becker ER, Steinwald B. Determinants of hospital casemix complexity. Health Serv Res. 1981; 16:439-58.

10. Thompson JD, Fetter RB, Shin Y. One strategy for controlling costs in university teaching hospitals. J Medical Educa. 1978; 53:167-75.

11. Martz EW, Ptakowski R. Educational costs to hospitalized patients. J Medical Educa. 1978; 53:383-6.

12. Simborg DW. DRG creep: a new hospital-acquired disease. N Engl J Med. 1981; 304:1602-4.