NBER WORKING PAPER SERIES

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Working Paper 6896
http://www.nber.org/papers/w6896

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 1999

The research was supported in part by a grant from the National Institute on Aging to Duke University (2R01-AG-09468-04A1). The views expressed here are those of the author and do not reflect those of the National Bureau of Economic Research.

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ABSTRACT

This study investigated whether the type of hospital in which a Medicare beneficiary is admitted for hip fracture, stroke, coronary heart disease, or congestive heart failure matters in terms of amount and timing of Medicare payments and survival. In total, government hospitals were the least expensive for Medicare, with major teaching hospitals being most expensive within 6 months of admission after the index event. Survival was best in major teaching hospitals. When considering payments subsequent to those for the initial hospitalization, Medicare spent more for patients admitted to for-profit hospitals than for those admitted to other non-teaching facilities, but had similar outcomes measured by survival. Payments on behalf of patients treated in for-profit hospitals were higher for Medicare Part B and home health, especially during the first two months following discharge from the initial hospital. Results of our research suggest that Medicare has a definite financial interest in where Medicare beneficiaries are admitted for their hospital care.

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1. Introduction

In principle, the appropriate decision as to ownership rights of the firm should be based on that arrangement that minimizes the transactions costs between the firm and the various parties with which it deals, including suppliers of capital funds, input suppliers, and purchasers of the firm's products. Even in the United States in which investor-owned firms are clearly the predominant form of organization, many other ownership forms exist, including employee-owned enterprises, farmer-owned cooperatives, consumer-owned electric utilities, occupant-owned condominiums, and mutual insurance companies (Hansmann 1996).

Unlike most other sectors, for-profit organizations constitute a minority of firms supplying hospital care in the United States and in all developed countries. In the United States, such hospitals constituted only 15 percent of all nonfederal short-term general hospitals in 1996 (American Hospital Association 1998). By contrast, 59 percent of hospitals were organized as private non-profits, and the rest were operated by governments, primarily local governments, or special government authorities.[1]

Another stylized fact is that growth of for-profit hospitals' market share has been moderate (Fig. 1), although for-profit chains have grown both numerically and in influence since they first appeared in the late 1960s while the share of small independent for-profit hospitals has declined. Growth in the chain for-profit share has not been steady, but rather there have been cycles in growth

(Gray and Schlesinger 1997)

Private non-profit firms differ from their for-profit counterparts in several respects. In contrast to a stock company, there are no investors who supply equity in return for a share of any profit that the firm earns ("residual claimants"). There is an equity market for philanthropic funds, but, in the case of U.S. hospitals, such funds are a small and decreasing proportion of total capital and operating funds (Sloan et al. 1990). Charters of non-profit corporations often contain provisions forbidding private inurement. Thus, managerial compensation is not directly linked to profits earned by the enterprise. In contrast to a for-profit firm, managers cannot be incentivized with stock options. Although boards of directors of for-profit firms are at least nominally elected by equity holders, in the case of non-profit enterprises, boards are generally self-perpetuating, that is, selected by previous boards. Finally, non-profit organizations enjoy certain tax advantages, including exemption from property taxes, corporate income taxes, access to philanthropic funds which offer exemption from personal income taxation, and better access to tax exempt debt finance than for-profit firms. In the case of hospitals, the tax advantages realized by private non-profits is not substantial. One study estimated the advantages to be worth about three percent of revenue (Becker and Sloan 1985). Further, tax advantages may be eroding in various ways. For example, some municipalities charge user fees for various services such as refuse collection and police and fire protection.

In general, economists have had a predilection for the for-profit ownership form. The argument supporting this position, termed property rights theory, goes as follows. Consider a sole proprietorship, say a laundry. The proprietor values profit, but s/he may have other values as well. For example, the proprietor may like to play golf on Thursday afternoons. In deciding to close the shop, the proprietor weighs the value of the lost profit against the utility gain from golf. Depending on the relative utility gain, the proprietor decides whether or not to close the shop. Similarly, the proprietor may have friends who may not wear clean shirts, and the proprietor may gain utility from doing the shirts for free. Again, the decision about whether to provide clean shirts depends on the relative value of the money to be derived by charging the full amount versus the "warm glow" to the proprietor from washing the shirts for reduced or no compensation.

Since there are no equity holders, managers of the non-profit firms do not face the same tradeoff. In economic jargon, the price of nonpecuniary benefits is attenuated, i.e., this price is reduced. Thus, the manager buys more nonpecuniary benefits. Such benefits may take the form of inefficiency, such as by avoiding the aggravation of being a boss, golf (leisure), or donating service.

While in many contexts, preference for the for-profit form may be a "slam-dunk," in the context of hospitals, matters are not so simple. According to property rights theory, for-profit firms are more efficient. Yet in some communities, hospitals are the major employers, and citizens appear to value

some featherbedding. The community, and especially members of the hospital medical staff, may enjoy tax advantages, the former because some taxes to the state and the federal government are returned to the community. Although these considerations may be viewed as manifestations of market failure, other forms of behavior may be widely viewed as market perfecting. For example, reducing the "price" of provision of free care may be the most efficient mechanism for redistributing care to the uninsured. Further, given asymmetric information, a profit-seeking hospital may induce demand for services, especially when the out-of-pocket price to the buyer is negligible or even zero. With the cash flow to those in control reduced in the non-profit form, such behavior may be less likely. In fact, without much empirical evidence, various critics have voiced concern that consolidation of hospitals under the aegis of publicly-traded corporations will mean higher priced and lower quality care, and lower rates of production of unprofitable outputs, including provision of care to persons without health insurance (see, e.g., Kuttner 1997).

Since the early 1980s, U.S. hospitals, and more recently physicians, have lost a great deal of their power to set price. This change reflects changes in government insurance payment practices and growth of various forms of managed care. As price takers, these firms still have latitude in selecting patient mix, in the quantities of services used to treat specific conditions (quality), and in accounting practices that potentially affect the amounts they are paid. Most recently, it has

been alleged that the largest for-profit hospital firm, Columbia-HCA, has bilked the Medicare program by billing for services that were not provided or not needed and by using various accounting loopholes to increase payments from Medicare. Also by aligning itself with local physicians and other suppliers of service, referral patterns and cash flows to other health care providers have changed (increased) as well.[2] This issue is not only important because of the specific allegations made against this firm, but also there is some concern that this behavior may generalize to other for-profit hospital companies. For this reason among others, hospital conversions to the for-profit form are receiving much greater scrutiny by state attorneys' general and others than heretofore (Singer 1997; Horwitz 1997).

This study reasks an old question with much better data: how does hospital ownership affect performance in terms of cost and quality? We ask, following a sudden, unanticipated adverse health event, does it matter to which type of hospital a Medicare beneficiary is taken? In this study, cost is measured by actual Medicare payments, both for hospital and for nonhospital care. Nonhospital care is relevant because of various vertical arrangements, both explicit and implicit between hospital and nonhospital providers that may vary systematically by ownership form. For example, at discharge, a patient may be more likely to be referred to a home health agency if the hospital has a contractual relationship with such an organization. Also, physicians sometimes have equity interests in the

hospitals to which they refer patients or are incentivized in other ways less easily detected by outsiders.

Payments do not directly measure operating efficiency in the sense of lower laundry cost per unit of output. Yet they do measure the use of services, conditional on an adverse health event having occurred. In addition to analyzing payments, we assess variations in direct measures of intensity of hospital care by ownership and other factors. We study outcomes, thus allowing a direct test of differences in quality by ownership form. Economists and others have long suspected that non-profit hospitals may buy extra quality with internal funds generated from profit flows (see e.g., Newhouse 1970). However, empirical tests of the quality hypothesis have been limited, largely for lack of data. In this article, we focus on long-term survival following an initial admission to a hospital for a health shock. Elsewhere, we have reported results on other outcome indicators (Sloan et al. 1998; Taylor et al. 1998).

For this analysis, we used data on a national sample of almost 2,700 elderly patients who were hospitalized in almost 1,400 facilities for one of four major health shocks. We obtained Medicare data for these patients for a period up to 11 years following the shock. With household survey data, we were able to measure health before and after the shock. The data also allowed us to identify the hospital to which the patient was admitted following the shock.

Section 2 describes our data and Section 3, our empirical methods. Section

4 presents our empirical findings. Section 5 concludes the study.

2. Data

The study sample was drawn from the National Long-Term Care Survey (NLTCS) which is a panel study fielded in 1982, 1984, 1989, and 1994. Overall, 35,800 Medicare beneficiaries were included in the data base for at least some time. NLTCS drew its sample from Medicare enrollment records for persons 65 years of age and older. A screener interview was administered to all 35,800 beneficiaries. Based on responses to the screener, full interviews were conducted with persons who reported having at least one limitation in activities of daily living (ADLs) or in instrumental activities of daily living (IADLs) lasting for three months or longer or expected to last at least this long.[3] Respondents lived in the community or in other facilities, most notably in nursing homes. The NLTCS collected detailed information on functional and cognitive status, health conditions, demographic characteristics of the family including potential caregivers, education, race/ethnicity, and income, including sources of income and wealth.

NLTCS was merged with data from other sources. First, data on all Medicare claims, inpatient, outpatient, Part B physician, home health, skilled nursing facility, and hospice from 1982 through 1995 were merged with all individuals screened by NLTCS in any year (Manton et al. 1995; Center for Demographic Studies 1998). Each claim included information on diagnoses and

amounts billed and paid by Medicare. Using hospital identifiers on the claim, we could identify the hospitals which in turn allowed us to assign ownership codes using data from the American Hospital Association. Also using AHA data, we assigned values of the resident-to-bed ratio by hospital and year as a measure of the intensity of teaching activity at the hospital. Dates of deaths for all NLTCS respondents were verified from Medicare enrollment records, the National Death Index, and state vital records systems for all NLTCS respondents (Center for Demographic Studies 1998).

For purposes of this analysis, we selected persons who were admitted to hospitals for stays of 91 days or less with primary diagnoses of hip fracture, stroke, coronary heart disease, or congestive heart failure; individuals dying on date of index admission were included. We selected the first admission for these conditions that occurred starting in 1984. Since we had Medicare claims data starting in 1982 and the 1982 NLTCS asked about conditions during the preceding year, we had a minimum of a three-year look-back period for ascertaining "first" admissions for a particular condition. A purpose for limiting the empirical analysis to first shocks was to reduce the influence of factors affecting outcomes we could not measure (omitted heterogeneity), such as persons who select a hospital for a hard-to-treat condition after care at other hospitals failed to yield desired results.[4] For measuring rehospitalization for the same diagnosis, there had to be at least three days between a discharge and a subsequent

admission. This criterion was selected because preliminary analysis revealed that some Medicare patients were discharged and readmitted to the same hospital on the same day; these cases likely represented transfers between units within the same hospital, or transfers to other types of facilities to continue care (such as a rehabilitation hospital).

Our case selection process resulted in a pooled analysis sample of 2,674 patients who were admitted to 1,378 different hospitals throughout the United States. Once a case was selected, it was followed through the end of 1995 or death whichever occurred first.

To assess differences in performance by ownership, we classified hospitals into five mutually exclusive categories. If a hospital had residents, it was classified as a teaching hospital. Teaching is associated with higher cost (Sloan et al. 1983; Garber et al. 1984; Iezzoni et al. 1990) and differences in casemix (Sloan and Valvona 1986). We defined the facility as minor teaching if the facility had a resident-to-bed ratio of less than 0.097, which was the median ratio for our sample. Otherwise, the teaching facility was major. Medicare has used the ratio of residents per bed as a measure of teaching intensity for purposes of subsidizing teaching hospitals (Iglehart 1998). In the vast majority of cases, 86 percent for both minor and major teaching facilities, the teaching hospital was organized on a private non-profit basis. With the exception of a single patient observation, the rest of the patients admitted to major teaching hospitals were admitted to

government facilities. For minor teaching hospitals, the remaining 14 percent were distributed as six percent government and eight percent for-profit. Hospitals with no residents were classified as non-teaching hospitals. We split non-teaching hospitals into these ownership categories: for-profit; private non-profit; and public. Patient sample sizes by category were: for-profit (N=226), government (N=416), and private non-profit hospitals (N=1,197), minor teaching (N=421), and major teaching hospitals (N=414).[5]

We investigated differences in the use of invasive cardiology techniques from the date of the index admission through December 31, 1995 among the 877 patients in our sample who were admitted for a primary diagnosis of coronary heart disease. Because our Medicare claims data made it difficult to accurately determine whether or not rehabilitation services were provided to beneficiaries before 1990, only the period 1991-95 was used to analyze differences in receipt of rehabilitation services by hospital type. We drew a sample of all persons suffering a hip fracture or a stroke from January 1, 1991-December 31, 1994, whether it was their index (first) event or not. We allowed for more than one observation for re-fractures and re-strokes if the subsequent admission occurred at least one year from the first event we observed from 1991-94. This selection process resulted in a sample of 486 persons with hip fractures and 533 with strokes.

3. Empirical Methods

Overview. Our empirical analysis assessed the effect of ownership on Medicare

payments, service intensity, and on quality of care. Our payment measures included not only the amount paid by Medicare for the index admission but payments made by Medicare up to six months following the index admission. On quality of care, we examined the effect of ownership on mortality.

Dependent Variables. To measure Medicare payments, we specified two dependent variables: (1) total Medicare payments on behalf of the beneficiary during the first six months; and (2) total Medicare payments during the first six months less Medicare payments associated with the first hospital stay, including physician Part B payments for the period of the index admission. All monetarily-expressed variables were converted to 1994 dollars using the Consumer Price Index, all items.[6]

We analyzed Medicare payments after the initial hospitalization for the following reasons. Some hospitals may offer more intensive care immediately after the health shock occurs (such as thrombolytic therapy), which produces savings in care. As a result, rehospitalization rates may be lower or the probability of being institutionalized in a nursing home may be lower. Alternatively, hospitals may not offer higher intensity at the first admission. Rather they may refer patients to service providers with which they have contractual relationships, thus possibly raising Medicare payments after discharge. The second possibility is not mutually exclusive with the first, but the impact on Medicare payments may be the opposite.

We constructed a sample to describe monthly payments after the initial admission for those patients who were discharged alive from the hospital the first time they were hospitalized after the shock (2,443 of 2,674). The six month follow-up period began with the day of index admission and ended six months later, and was identical to the period used for total payments. We included all Medicare payments with one exception. We did not include hospice payments since virtually no patients in our sample had hospice claims.

We measured the probability of being discharged dead from the index admission, and for beneficiaries discharged alive from the index admission, we measured time to death. Although the data identified dates of death, for computational reasons, we converted the data into weeks. In our sample, 1,924 (72%) died during the study period (through December 31, 1995); 231 (9%) died during the index admission, and 1,693 (63%) died subsequently.

Differences of means for the receipt of cardiac catheterization, angioplasty, and coronary artery bypass graft (CABG) surgery subsequent to an index admission were compared for persons with a primary diagnosis of coronary heart disease. We analyzed the probability of receipt of cardiac catheterization (N=245, 28%) and receipt of angioplasty or CABG surgery (N=147, 17%), taking into account the fact that some beneficiaries died before they could receive the procedure.

We analyzed the probability of receipt of rehabilitation within one year of

an admission for a hip fracture (394 of 486, 81%), and after a stroke (360 of 533, 68%).

Ownership and Teaching Status. Our analysis focused on the role of ownership and teaching status of the hospital to which the beneficiary was first admitted. We used the five categories described above, with for-profit, non-teaching hospitals, the omitted reference group.

Other Explanatory Variables. Other explanatory variables fell into four categories: demographic/income; health pre-shock; primary diagnosis at index admission; and other. These variables are described in Table 1.

Estimation. For the payment analysis, we ranked beneficiaries in descending order according to how much Medicare spent on their behalf. We then split the sample into fifths. We then used ordered logit analysis to determine why beneficiaries fell into specific quintiles.[8]

We estimated a logistic regression model to estimate the probability of being discharged dead from the index admission. We used a Cox proportional hazard model with one outcome (death) from time of being discharged alive to December 31, 1995. Logistic regression was used to estimate the probability of receiving a heart catheterization procedure, and a competing risks model was estimated using a Cox proportional hazards model for two outcomes, death and receipt of angioplasty or coronary artery bypass graft (CABG) surgery for the 877 cases with a diagnosis of coronary heart disease. Logistic regression was used to

estimate the probability of receipt of rehabilitation.

4.0 Results

4.1 Medicare Payments.

On average, Medicare spent $11,680 (1994$) in total during the first six months following the index admission date (Table 2). Of this, only three-fifths of the total, including payments to hospitals and physicians for care in the hospital, was spent on the index admission.

Among the five ownership-teaching status categories, Medicare spent the least on patients admitted to government hospitals ($8,869) and the most on patients admitted to major teaching facilities ($14,870). Spending on patients admitted to for-profit and private non-teaching, non-profit hospitals was very similar--$11,657 versus $11,435. The difference in Medicare payments after the index admission among these ownership forms was somewhat greater; spending on the index admission accounted for 58 percent of the total for-profit but 60 percent for the non-profits. On average, eight percent of Medicare payments for the index admission went for either physician Part B or for outpatient care (not shown in table). This percentage varied only little among the five hospital categories.

Overall, for Medicare payments after the index admission, most payments during the first six months went for rehospitalization (53%), followed in descending order by Part B physician and outpatient (23%), skilled nursing

facility (14%), and home health (10%) (Table 2). Compared to the other hospital types, such payments were relatively high for patients initially hospitalized in for-profit facilities for Part B physician/outpatient and home care. Such payments were slightly below average for skilled nursing care and rehospitalization.

The time path of payments after discharge from the initial hospital stay also differed by ownership and teaching status (Table 3). Considering patients discharged from the index stay alive, for for-profit patients, Medicare paid $1,275 for the rest of the first month on average, and $1,498 for the second month. By month 6, for the 89 percent of patients who were still alive of those discharged from the index stay alive, payments were $706 on average. Compared to the other types of hospitals, patients admitted to for-profits incurred much higher expenses for the rest of the first month. Month 2's payments for for-profits were similar to those for non-teaching non-profits and for major teaching hospitals, but greater than for hospitals in the remaining categories, especially non-teaching public and minor teaching facilities. By Month 6, these differentials were much smaller.

Non-teaching public hospitals were the low-cost outlier, measured in terms of payments to Medicare. Patients admitted to such facilities evidently received much less care immediately after the index stay, possibly because they more often lacked a regular physician.

Holding other determinants of cost in ordered logit analysis constant, total Medicare payments on behalf of patients admitted to government facilities were

lower and such payments on behalf of patients admitted to major teaching hospitals were higher than those for the omitted reference group, for-profit hospitals (Table 4). On average, payments for non-profit patients tended to be lower and those for minor teaching hospitals higher, but these differences had high associated standard errors. Based on the parameter estimates, the probability of total Medicare payments being in the highest fifth of such payments was 0.08 lower for government than for for-profit facilities. Corresponding differences between the other hospital ownership categories and for-profit hospitals were: -0.01 for non-profits; 0.01 for minor teaching; and 0.06 for major teaching hospitals. Given our specification, probabilities of being in the lowest quintile (not shown) were almost the same in absolute value as those for the top quintile. Without the covariates described in Table 1 (not included in Table 4), differences between probabilities of total payments being in the top quintile relative to for-profits were generally somewhat higher in absolute value: -0.07 for government; -0.00 for non-profit; 0.04 for minor teaching; and 0.11 for major teaching hospitals.

Excluding total payments for index admission, payments on behalf of patients admitted to for-profit hospitals tended to be relatively high. The probability of being in the top quintile in the distribution of payments made by Medicare on behalf of beneficiaries was 0.04 higher for for-profits than for non-profit hospitals. The exception was major teaching hospitals. Holding other

factors constant, the probability of being in the top quintile of payments made after the index stay was identical for patients admitted to for-profit and major teaching hospitals.

4.2. Intensity of Treatment.

For the 877 patients admitted for one of the three coronary heart disease (CHD) diagnoses, 27.9 percent received a cardiac catherization, 5.1 percent an angioplasty, and 13.3 percent coronary bypass surgery (CABG) at some time after the date of index admission (Table 5). In the event that the patients received both, the patient was classified under the type of therapeutic procedure (angioplasty or CABG) that occurred first.

Compared to the overall mean of the sample, CHD patients initially admitted to for-profit facilities were less likely to have received a cardiac catherization and an angioplasty but more likely to have had CABG. Patients admitted to public facilities were much less likely to have received cardiac catherization or bypass surgery. Rates for all three types of procedures were relatively high for teaching hospitals.

Logit analysis of the probability of cardiac catherization that took account of other covariates confirms the descriptive findings (Table 6). The probability of having this procedure was 0.07 lower for patients admitted to government facilities than for those admitted to for-profit facilities. The probability for CHD patients admitted to major teaching hospitals was 0.11 higher.

Holding other determinants constant, patients with stroke who were initially admitted to for-profit facilities were more likely to have received rehabilitation (Table 7). The differences from the omitted reference groups for-profit facilities, were statistically significant for teaching hospitals but not for non-teaching hospitals. Interestingly, in this respect, treatment was more intensive for patients initially admitted to non-teaching than to teaching hospitals. We found no differences by hospital ownership or teaching status in the probability of receiving rehabilitation after hip fracture.

In sum, patients admitted to for-profit hospitals were no more likely than other patients to have received intensive treatment for CHD with the exception of those admitted to non-teaching government hospitals. On rehabilitation, patients at such hospitals were not treated differently from patients at other types of non-teaching hospitals.

4.3 Readmission Patterns.

Overall, 66.4 percent of patients who were discharged alive were readmitted for the same primary diagnosis at some time before the end of 1995 (Table 8). Almost a quarter of the patients died before they could be readmitted (24.1%). Only a tenth (9.5%) were alive on December 31, 1995 and had not been readmitted by that date ("censored" observations).

Differences among the ownership-teaching status types were relatively minor, and none of the differences were statistically significant at conventional

levels. Readmission rates ranged from 64.8 percent for non-profit to 70.1 percent for major teaching hospitals. The patients initially admitted to non-teaching government facilities were least likely to have reached the end of our time series (December 13, 1995) without being readmitted for the same diagnosis as at the index admission (6.7%) (were least likely to be censored).

Overall, 18.3 percent were readmitted to a different hospital than their choice for the index stay. Patients admitted to government facilities for the index stay were least likely to switch (15.9%), but controlling for deaths, for-profit hospital patients were least likely to switch. By contrast, patients initially admitted to teaching hospitals were most likely to switch. Interpreting readmission as a measure of quality (admittedly an imperfect measure), for-profit hospitals fared well in this regard.

4.4 Survival.

Although the parameter estimates were uniformly positive, suggesting lower discharge mortality for those admitted to for-profit facilities, none of the parameter estimates in the analysis of the probability of being discharged dead from the index admission were statistically significant at conventional levels (Table 9).

For those who survived the index stay, life expectancy was higher for patients initially admitted to major teaching hospitals than for those admitted to for-profits. Although the parameter estimates on the other variables had the same

sign as the binary variable for major teaching facilities showing better survival relative to for-profits, none was statistically significant at conventional levels. Thus, on this dimension of quality, for-profits were roughly equivalent to other non-teaching hospitals.

5.0 Discussion

The choice of ownership form is an important matter for public policy. For one, governments confer certain tax advantages on non-profits. Offsetting these advantages, is the inability of non-profits to raise capital by selling an ownership interest to investors. An important policy question is whether society receives value for the tax subsidies it grants non-profits.

Various public agencies are involved in deciding whether a hospital with particular characteristics should be allowed to enter the market. For several decades, state certificate of need agencies have had the authority to allow or disallow hospital entry. In recent years, state attorneys general have begun to assert their supervisory authority over disposition of assets by public charities, including hospitals desiring to switch from non-profit to for-profit ownership. Decisions by public agencies are often made in an adversarial process without much reference to the empirical evidence about how ownership affects behavior. Interestingly, the federal government has not been involved in hospital ownership-related issues. Such programs as Medicare and Medicaid, however, do have the power to bar a hospital from receiving payment if there is a determination of

substandard quality of care or fraud. This power is rarely exercised; and when exercised, public agencies may expect considerable opposition from the affected hospital and its constituency. Results of our research suggest that Medicare has a definite financial interest in where Medicare beneficiaries are admitted for their hospital care.

The answer to the question posed by this chapter's title is "yes, choice of hospital does matter." Along one dimension, hospital ownership, two differences are noteworthy as is one lack of difference. The two noteworthy differences pertain to (1) the lower total Medicare expenditures on behalf of patients admitted to government facilities and (2) the higher expenditures on behalf of patients admitted to for-profit facilities post discharge, especially during the first two months following hospitalization. A third difference, lower survival for patients initially admitted to government facilities, appeared in the descriptive statistics, but did not withstand the addition of other covariates in the multivariate analysis.

The noteworthy nondifference is the high degree of similarity between for-profit and private non-profit non-teaching hospitals other than on Medicare payments. Above, we reported results on survival that showed no differences among non-teaching hospitals. In other analyses not reported in this chapter, we studied other measures of health outcomes including activities of daily living, instrumental activities of daily living, being in a nursing home versus the community, and cognitive status. For all of these measures, patients initially

admitted to major teaching hospitals had the same or better outcomes. As with this analysis, there was no difference between non-teaching for-profit and non-profit hospitals (Sloan et al. 1998; Taylor et al. 1998).

The higher levels of Medicare spending on for-profit hospital patients for physicians' services and home health compared to non-profit hospital patients may reflect greater vertical integration in for-profit facilities, both contractual and informal. Criteria for referrals after hospital discharge are not well developed. In the absence of firm clinical criteria, financial incentives may dictate choices (Potthoff et al. 1997). Examples of vertical integration in this context are a hospital owning a home health facility or having informal understandings with medical staff about referrals. Higher expenditures for such care may be a manifestation of such integration. More probing is needed to determine whether in fact for-profit facilities are more tightly integrated on average. To understand the informal contractual relationships (or informal arrangements), it will be necessary to conduct in-depth case studies of a few hospitals.

We found that patient survival was better in major teaching facilities, with and without controls for other influences. Medicare payments were higher. But controlling for other factors, Medicare payments subsequent to the discharge from the index hospital were about the same as for for-profit hospitals and higher on average than for the other hospital types. Major teaching hospitals received higher levels of subsidies from Medicare for disproportionate share and for medical

education. We did not eliminate these subsidies from our calculations. However, if one did, some differences in Medicare spending would still remain.

Several studies have compared cost by hospital ownership and teaching status. Fewer have compared quality of hospital care. The most rigorous large-scale empirical study of quality that permits comparisons by hospital ownership and teaching status is by Keeler et al. (1992). The authors found no difference in quality between non-profit and for-profit hospitals on two quality indicators, whereas public hospitals fared worse on both criteria. However, on a third measure, there was a statistically significant difference between quality of care of non-profit hospitals and that of for-profit and public hospitals favorable to non-profits. Keeler et al. appear to have been more persuaded by the results of the first two indicators. They concluded that "non-profit and for-profit hospitals provide similar care overall" (p. 1712). Hartz et al. (1989) found that mortality was higher in for-profit than in non-profit hospitals, but they used fewer covariates than we. Shortell and Hughes (1988) found no difference in quality of care by ownership. On structural measures of quality, such as percentage of hospitals with Joint Commission of Hospitals Accreditation and percentage of hospitals with intensive care units, the two organizational forms are quite similar (Herzlinger and Krasker 1987).

Compared to previous studies, the most important innovations of our research are its longitudinal feature, inclusion of Medicare payments after the

index admission, direct measures of intensity of care, and a much larger number of controls for other determinants of payments and patterns of care. Also, in our analysis, we studied several adverse health events that are common among elderly persons.

With the longitudinal data, we were able to track outcomes for up to 11 years. We limited our analysis of Medicare payments to the first six months following the index admission. We could have followed such payments for longer time spans. However, much of the expenditure is incurred during the first six months.[9]

Generally, the number of variables available for inclusion falls as the data base becomes more nationally representative and covers a longer historical period. In this study, we were able to include a comparatively large number of demographic variables, including educational attainment, family income, health and functional status and living arrangements before the adverse health event occurred. By contrast, with Medicare claims data or hospital discharge abstracts, the researcher has only very limited information on the patient, such as age, race, gender, and, if provided, geographic location. Thus, although there may have been some omissions of more subtle patient characteristics and on severity of the health shock, we did control for many of the important variables.

We analyzed four major conditions affecting large numbers of elderly. For three of the conditions, admission is likely to be largely unanticipated and sudden.

For the fourth, congestive heart failure (CHF), admission typically represents a serious exacerbation of a condition for which the patient sought care previously. Although admission for these conditions represent only a small proportion of all hospital admissions by the elderly, often data limitations compel the researcher to generalize based on one condition.

Finally, patient selection of hospital may be endogenous. Although patients are likely to be limited in their ability to select a hospital given an unanticipated health shock of the kinds included in our study, for-profit hospitals may be more likely to locate where demand for hospital care is high (Norton and Staiger 1994). Possibly patients with more serious and complex conditions were admitted to high input hospitals. In research we conducted with hospital choice as endogenous (Sloan et al. 1998), we found statistically significant differences in Medicare payments between for-profit and government facilities, as reported here, and between for-profit and non-profit facilities. The "notable nondifference" in this chapter would become a "notable difference." The estimates presented here, if anything, on higher payments for for-profits are conservative.

Endnotes

1. In terms of average daily patient census adjusted for outpatient output, shares in 1996 were: 71 percent private nonprofit; 10 percent for-profit and 18 percent government (American Hospital Association 1998).
2. See e.g., Eichenwald (1997).
3. The ADLs were using help eating, getting in or out of bed, moving around inside, dressing, bathing, and using the toilet (maximum of six). The IADLs were using help in less personal ways, such as doing housework and preparing meals (maximum of six).
4. Evidence on hospital switching at readmission to a hospital for the same diagnosis is presented below.
5. In terms of ownership shares the split by ownership in our sample is almost identical to the national distribution of average daily hospital census in the mid 1990s. See footnote 1.
6. In some cases, negative Medicare payments were shown. These appeared to be corrections of previous billing errors as they were identical in absolute magnitude to a positive Medicare payment item in the same record. These cases were balanced to zero.
7. The PSUs were defined as Standard Metropolitan Statistical Areas for persons in metropolitan areas and counties for persons living in nonmetropolitan areas. There were 173 PSUs in 42 states.
8. This specification was used because of the strong right-skewdness of

distribution of Medicare payments and because preliminary analysis suggested a problem with heteroscedasticity, when the dependent variable was in log form, making interpretation of the effect of covariates on the dependent variable difficult. On this issue, see Manning (1998). The upper bounds for the total payment dependent variable were $4,126; $6,687; $10,708; $ 17,335; and $102,534. For total payments less index payments, the upper bounds were $142; $ 975; $3,355; $8,623; and $72,413. There was a substantial range in payments in the top quintiles.

9. We found this in calculations not presented. For the time path of Medicare payments for stroke using a much larger Medicare sample but with fewer explanatory variables and patient characteristics, see Lipscomb et al. (1998).

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Table 1. Explanatory Variables Used in Multivariate Models

Ownership/Teaching	
Government	Non-teaching government hospital in the year of index admission
Non-Profit	Non-teaching non-profit hospital in the year of index admission
Minor Teaching	Teaching hospital with some, but less than 0.097 residents-per-bed set up and staffed in the year of index admission
Major Teaching	Teaching hospital with 0.097 or more residents-per-bed set up and staffed in the year of index admission
For-Profit	Non-teaching for-profit hospital in the year of index admission is the omitted category
Demographic/Income	
Age	Age on date of index admission, years
Male	Male gender
Education	Years of education, at NLTCS interview before index admission
White	White race, black and other omitted
Married	Married, at NLTCS interview before index admission
Income ('0000)	Total family income, at NLTCS interview before index admission
Health, Pre-shock	
Lived in community	Lived in the community, at NLTCS interview before index admission
No. ADL limitations	Number of limitations in Activities at Daily Living, at NLTCS interview before index admission (eating, getting in/out of bed, moving around inside, dressing, bathing, using a toilet, max of 6)
Cognitively aware	Answered 7 or more questions correctly from the Short Portable Mental Status Questionnaire, at NLTCS interview before index admission (Pfeiffer 1975)
Lack bladder/bowel control	Reported losing control of bladder or bowels, at NLTCS interview before index admission
Primary Diagnosis at Index Admission	
Comorbidity index	D_XCG concurrent risk model, calculated using ICD-9-CM codes

	other than primary diagnosis, measured at index admission (D_xCG 1996; Ellis 1996)
Hemorrhagic stroke	Hemorrhagic stroke
Ischemic stroke	Ischemic stroke
Other hip fracture	Other hip fracture (pertrochanteric fracture is omitted disease type)
Congestive heart failure	Uncomplicated congestive heart failure
Congestive heart failure/other	Congestive heart failure with hypertension/renal disease
Heart attack	Acute myocardial infarction
Angina pectoris/unstable	Unstable angina or angina pectoris
Ischemic heart disease	Ischemic heart disease
Other	
Time	Year of index admission, equal to 1 in 1984 to 11 in 1994
Population sq. mil (000)	Population per square mile in resident PSU in year of index admission (conurbations of counties for metropolitan areas, single counties in non-metropolitan areas)
NLTCS year	Year of NLTCS used for variables measured before index admission (1984=1, 1989=2, 1994=3)
New cohort	Person who first answered the NLTCS interview in 1989 or 1994

Table 2. Medicare Payments Within 6 Months

Ownership/ Teaching	Index Admission	Post Index Admission	Total 6 Months
For-Profit	6,742	4,915	11,657
Government	5,167[a]	3,704[a]	8,869[a]
Non-Profit	6,893	4,542	11,435
Minor Teaching	7,661[c]	4,369	12,030
Major Teaching	8,729[a]	6,142[a]	14,870[a]
Total	7,017	4,664	11,680

Note: Rows may not sum exactly due to rounding. N = 2,674 for total table.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$ for t-test (2 tailed) of mean Medicare payments.

All t-tests are comparisons with for-profit hospitals.

Table 3. Medicare Payments Post Index Admission (Persons discharged alive from index admission)

Ownership/ Teaching	Total 6 Months	Month after Discharge 1	2	3	4	5	6
Total							
For-Profit	5,290	1,275	1,498	819	595	695	706
Government	4,163[c]	528[a]	903[a]	898	770	789	590
Non-Profit	4,965	821[c]	1,400	934	783	791	504
Minor Teaching	4,765	851	1,063[c]	1,050	822	554	705
Major Teaching	6,656[c]	968	1,495	1,519	1,041[b]	954	936
Total	5,104	844	1,295	1,031	813	771	635
Ambulatory (Part B and Outpatient)							
For-Profit	1,386	412	267	200	170	208	210
Government	947[b]	151[b]	197	182	179	184	127
Non-Profit	1,111	214[c]	241	228	198	159	134
Minor Teaching	1,215	186[b]	250	242	159	208	248
Major Teaching	1,469	265	312	310[b]	237	184	217
Total	1,182	225	249	234	193	178	171
Home Health							
For-Profit	718	73	200	212	105	102	74
Government	518	22[a]	140	137[a]	123	73	63
Non-Profit	506[c]	53	132	127[b]	84	74	67
Minor Teaching	420[b]	48	141	101	71	47[c]	34[c]
Major Teaching	477	51	155	134	63	50[c]	39

Total	508	49	144	133	87	68	57
Skilled Nursing Facility							
For-Profit	648	141	285	164	65	3	16
Government	497	98	191	107	75	34[c]	18
Non-Profit	750	195	303	129	50	78[a]	23
Minor Teaching	693	149	268	145	88	49[c]	24
Major Teaching	748	169	275	137	117	21[c]	48
Total	694	164	275	132	72	51	26
Rehospitalization							
For-Profit	2,537	649	746	243	256	382	404
Government	2,198	258[b]	375[b]	472[b]	393	497	381
Non-Profit	2,597	360	725	450	451[c]	481	281
Minor Teaching	2,437	469	404[c]	562[a]	504	250	399
Major Teaching	3,963[a]	481	753	939[a]	624[b]	698	633
Total	2,720	406	628	532	462	474	381

Note: Total payments following the index admission calculated using only those persons who were discharged alive from the index admission (N=2,443). Only persons surviving to the first day of a month were included in the denominator for each month.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$ for t-test (2 tailed) of mean Medicare payments. All t-tests are relative to for-profit hospitals.

Table 4. Ordered Logit Analysis of Total Payments and Total Less Index Payments

	Medicare Payments					
	Total First 6 Months			Total Less Index First 6 Months		
Explanatory Variables	Coeff.	(s.e.)	[m.e.]	Coeff.	(s.e.)	[m.e.]
Government	-0.56[a]	(0.15)	[-0.08]	-0.32[b]	(0.16)	[-0.05]
Non-Profit	-0.10	(0.13)	[-0.01]	-0.24[c]	(0.14)	[-0.04]
Minor Teaching	0.10	(0.15)	[0.01]	-0.25	(0.16)	[-0.04]
Major Teaching	0.41[a]	(0.15)	[0.06]	-0.00070	(0.16)	[-0.00]
N		2,674			2,443	

Note: Coeff. is coefficient, standard errors are in parentheses, marginal effects, shown in brackets, are for the probability of a patient being in the top 20% of total 6 month Medicare payments and Medicare payments after the index admission. We also included the covariates listed in Table 1 as explanatory variables. These results were not included in the table to permit focus on the variables of major interest.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$

Table 5. Use of Invasive Techniques After Index Admission for Coronary Heart Disease, by Hospital Type

Ownership/ Teaching	N	Patients Receiving Given Procedure (%) Heart Catheterization	Angioplasty	Coronary Artery Bypass Graft
For-Profit	72	23.6	2.8	15.3
Government	137	17.5	3.6	5.8[b]
Non-Profit	367	26.7	5.4	12.5
Minor Teaching	151	32.4	5.3	17.2
Major Teaching	150	38.0[b]	6.7	17.3
All	877	27.9	5.1	13.3

Receipt of procedure measured from index admission to Dec. 31, 1995.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$ for t-test (2 tailed) of mean value of percent of patients receiving procedure by hospital type. All t-tests are comparisons with for-profit hospitals.

Table 6. Probability of Receiving Cardiac Catheterization and Time to Invasive Cardiac Procedures Following CHD Index Admission

	Probability of Cardiac Catheterization			Time to Angioplasty or Coronary Artery Bypass Graft (weeks)	
Explanatory Variables	Coeff.	(s.e.)	[m.e.]	Coeff.	(s.e.)
Government	-0.39	(0.40)	[-0.07]	-0.73[c]	(0.43)
Non-Profit	0.086	(0.34)	[0.01]	-0.089	(0.32)
Minor Teaching	0.33	(0.38)	[0.05]	-0.099	(0.36)
Major Teaching	0.67[c]	(0.38)	[0.11]	0.17	(0.34)
N		877		877	
N receiving		245		147	

Note: Coeff. is coefficient, standard errors are in parentheses, marginal effects, shown in brackets, are for the probability of a patient receiving cardiac catheterization.

We also included the covariates listed in Table 1 as explanatory variables. The hazard model for time to angioplasty or coronary artery bypass graft surgery controlled for death using competing risks.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$

Table 7. Probability of Receiving Rehabilitation within One Year of Index Admission

	Stroke			Hip Fracture		
Explanatory Variables	Coeff.	(s.e.)	[m.e.]	Coeff.	(s.e.)	[m.e.]
Government	-0.49	(0.34)	[-0.10]	-0.49	(0.47)	[-0.06]
Non-Profit	-0.44	(0.29)	[-0.09]	-0.31	(0.35)	[-0.04]
Minor Teaching	-0.91[b]	(0.40)	[-0.19]	-0.55	(0.52)	[-0.07]
Major Teaching	-0.69[c]	(0.41)	[-0.15]	1.01	(0.71)	[0.12]
N		533			486	
N receiving		360			394	

Note: Coeff. is coefficient, standard errors are in parentheses, marginal effects, shown in brackets, are for the probability of a patient receiving rehabilitation within 1 year of index admission.

We also included the covariates listed in Table 1 as explanatory variables.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$

Table 8. Readmission Patterns (%)

	Readmitted		Not Readmitted		
Ownership/ Teaching	Same Hospital	Different Hospital	Died	Censored	N
For-Profit	48.7	18.6	24.3	8.4	226
Government	51.2	15.9	26.2	6.7	416
Non-Profit	47.8	17.0	24.3	10.9	1,197
Minor Teaching	45.4	21.4	25.9	7.6	421
Major Teaching	48.6	21.5	19.1	10.9	414
All	48.1	18.3	24.1	9.5	2,674

Note: Rows may not sum exactly to 100% due to rounding. Cells show percent of patients who were initially admitted to a particular hospital type, by readmission status. Died means that the patient died before being readmitted. Censored means the patient had not been re-admitted as of December 31, 1995 regardless of when the initital index admission occurred. Re-admission is for the same primary diagnosis. The minimum follow up time was 1 year for patients with index admissions on December 31, 1994.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$ for t-test (2 tailed) of percent readmitted, died and censored. All t-tests are comparisons with for profit hospitals. No differences were significantly different.

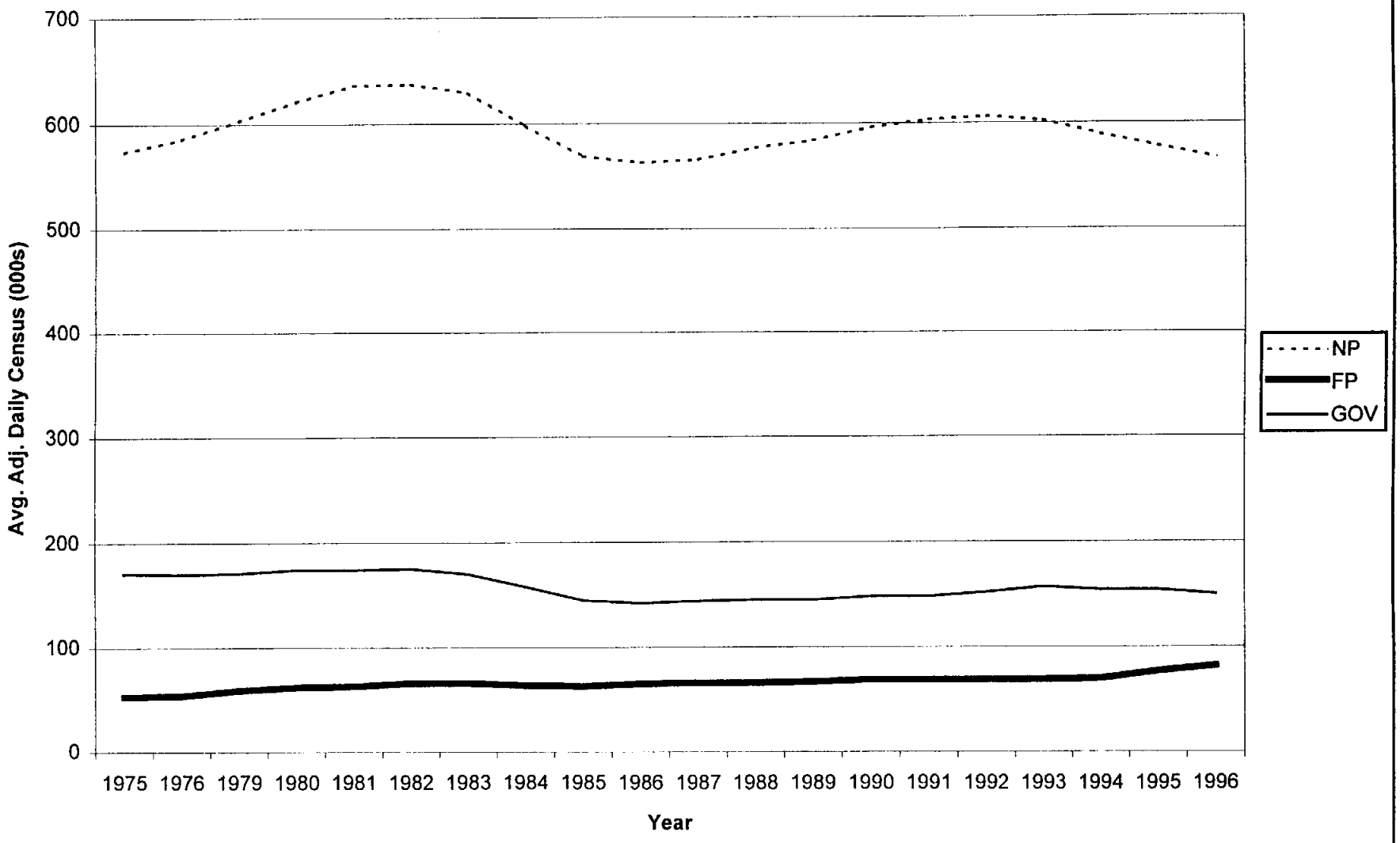
Table 9. Probability of Being Discharged Dead From Index Admission and Survival Conditional Upon Being Discharged Alive From Index Admission

	Probability Discharged Dead from Index Admission			Mortality Given Discharged Alive from Index Admission	
Explanatory Variables	Coeff.	(s.e.)	[m.e.]	Coeff.	(s.e.)
Government	0.52	(0.32)	[0.02]	-0.12	(0.10)
Non-Profit	0.21	(0.30)	[0.01]	-0.14	(0.090)
Minor Teaching	0.12	(0.33)	[0.01]	-0.13	(0.10)
Major Teaching	0.0011	(0.34)	[0.00]	-0.32[a]	(0.11)
N		2674			2,443
N Dead		231			1,693

Note: Coeff. is coefficient, standard errors are in parentheses, marginal effects, shown in brackets, are for the probability of a patient being discharged dead from the index admission. Mortality was followed from the date of discharge alive through December 31, 1995. We also included the covariates listed in Table 1 as explanatory variables.

[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$

Figure 1. Average Adjusted Daily Hospital Census in the U.S. by Ownership Type 1975-1996



Source: American Hospital Association (1998).