Factors affecting Medicaid patients' length of stay in psychiatric units

by Judith R. Lave and Richard G. Frank

The structure of the Medicaid program varies widely among the States. Examined in this article is the relationship between certain characteristics of the State Medicaid programs and the length of stay of patients who are discharged from psychiatric units in general hospitals. It has been found that setting limits on the number of reimbursable days leads to shorter lengths of stay and that, after controlling for region, length of stay is not influenced by utilization review or State rate setting.

Introduction

In recent years, in response to the rapid inflation that has occurred in the health care sector, significant changes have been taking place in the structure of third-party payment systems for hospital and medical services. One characteristic of this change has been the shift away from open-ended payment systems (based on costs or charges) to more constrained systems in which limits are set on the volume of services to be paid for and/or providers are paid on the basis of prospectively set rates. These new systems, of which the Medicare prospective payment system is the most important, are designed to promote behavioral changes by providers. Consequently, interest in studying provider response to payment incentives is increasing.

In many ways, the State Medicaid programs offer a natural experimental base for examining provider response. Subject to broad Federal guidelines, the States can establish their own rules governing individual eligibility; provider reimbursement method; and amount, duration, and scope of covered services. States have taken advantage of this flexibility to create 50 separate health care programs. Because the structure of incentives differs across the plans, the pattern of resource utilization would be expected to be different.

The purpose of this article is to examine the factors that affected the length of stay of Medicaid patients who were discharged from psychiatric units of general hospitals in 1981, with special attention to the structure of the Medicaid benefit package. The effect of these characteristics on the length of stay in these units is a measure of the response of this set of providers to financial incentives. Many psychiatric units in general hospitals are exempt from the Medicare prospective payment system (PPS). However, information on this estimated effect may provide some insight into how these providers would respond if covered. In addition, we can compare the response of units to variation in the structure of State Medicaid programs with what is known about the response of covered providers of psychiatric hospital services to the incentives embedded in PPS.

We begin the article with a brief overview of some of the policies that States have implemented to control the cost of inpatient hospital care, and we indicate how these policies might be expected to influence the length of stay. Next, we develop a more complete framework for considering the factors that affect patient length of stay. We go on to describe our data and to estimate a hospital length-of-stay model. We then use a statistical technique called survival analysis to explore in more detail the effect of the imposition of Medicaid limits on the distribution of the length of stay of all patients. We close with a summary and policy conclusions.

This article is an extension of an earlier article in which we also examined the effect of the structure of the Medicaid benefit package on the length of stay of patients discharged from psychiatric units in general hospitals (Frank and Lave, 1986a). This differs from the earlier article in two respects: The set of variables hypothesized to influence length of stay is more extensive, and nonparametric techniques are used to explore in more detail the effect of the policy variables on the whole length-of-stay distribution.

State Medicaid policy: Inpatient care

In order to control the cost of providing inpatient services to Medicaid eligibles, the States have implemented different policies regarding the number of covered days, utilization review requirements, and reimbursement methods. The combination of these policies forms what we call the benefit structure for inpatient hospital care. A variety of these policies existed in 1980.

In 1980, a number of States implemented programs with restrictive inpatient benefits; others supplemented an unlimited benefit with a set of regulations designed to control inpatient utilization. For example, 19 States set limits on the number of covered days per admission or per year, 7 established limits but allowed authorized extensions, and still others had general preadmission and/or utilization review programs.

In addition to the controls designed specifically to control inpatient utilization, some States implemented alternative reimbursement mechanisms. Although most States still followed the Medicare cost-based reimbursement principles in effect during 1980, 10 States had implemented alternative reimbursement

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systems. Most alternative payment systems involved the setting of prospectively determined per diem rates. However, New Jersey and Maryland had case-based payment systems.

Most States have long pursued policies to control their outlays for physician services. In general, this involves the implementation of fee schedules or the establishment of limits on the amount paid to physicians. Payments to physicians for the same services vary considerably across the States. For example, in 1980, the price paid by Medicaid for a physician office visit ranged from $4 in Mississippi to $20 in the District of Columbia.

The incentives embedded in these policies differ considerably. Per diem prospective rates, which are set at the level of the average cost of a day of care, provide incentives to decrease the intensity of care delivered each day and to increase the length of stay if the marginal cost of a day is below the average cost (Worthington and Piro, 1982). Frank and Lave (1986b) and Lave and Leinhardt (1976) have provided evidence of the decreasing marginal cost of inpatient days. Thus, we would hypothesize that the length of stay would be positively related to the presence of per diem rates.

Limits on reimbursable days create a discontinuity in a hospital's payment schedule; that is, a hospital is paid either a prospectively set per diem rate or a payment based on its costs until the point is reached at which marginal revenues are zero. At that point, the hospital must weigh the additional medical value of subsequent days of care against economic losses equal to the marginal cost of care. Thus, limits on reimbursable days create a clear incentive to provide treatment of a shorter duration than under either cost-based or prospective per diem payment systems (Seidman and Frank, 1985). We would also expect that lengths of stay in States that set prospective rates per case would be shorter than those in States with cost-based or prospective per diem payment systems (Jencks, Horgan, and Taube, 1987).

The effect of utilization review on length of stay is more difficult to predict a priori. Utilization review is a formal process put in place to monitor physician treatment and discharge decisions and, in particular, to review a patient's need for continued hospitalization. If the reviewers decide the patient no longer needs to be in a hospital, then the hospital will not be paid for further care (unless patients cannot be discharged because they have no place to go). Utilization review should be particularly effective in cases, such as psychiatry, that involve considerable discretion in the course of treatment (Goldman et al., 1984). Thus, utilization review is expected to be associated with a decrease in length of stay.

Most of the work on the effect of payment methods on the length of stay has been focused on the hospital as the decisionmaker (Frank and Lave, 1986a). (We use the term hospital to mean the individuals in the hospital who are responsible for setting policy.) It is the physician, however, who actually makes discharge decisions. In many cases, the physician's and the hospital's interests are congruent. Both the physician and the hospital are interested in providing high-quality services. Physicians as well as hospitals are interested in the financial viability of the institutions in which they work (Wilson and Jadlow, 1982; Rappaport, 1978). However, the physicians' and the hospitals' interests are not necessarily always congruent (Ellis and McGuire, 1986). Physicians get paid for visiting inpatients, and there is usually a visit for each day of hospitalization. Therefore, other things being equal, physician incomes will be higher the longer the length of stay. Consequently, physicians may encourage longer stays in States where higher physician payments prevail. Thus, the impact of limits on length of stay may be attenuated in States that have relatively high physician payments.

Hospital length-of-stay model

The structure of the Medicaid benefit package is not the only factor influencing patient length of stay. The characteristics of the patient population, the availability of alternative treatment settings, and the general level of overall demand for a particular facility are also important considerations. We assume, therefore, that, as shown in equation (1), length of stay is a function of four classes of variables:

$$LOS = f(P, C, S, B), \quad (1)$$

where P = patient characteristics that may influence the quality-quantity relationship, C = hospital characteristics that may influence the efficiency with which hospital services are produced, S = system variables that may facilitate hospital discharges, and B = the Medicaid benefit structure. The operationalization of each of these classes of variables and their expected effect on the length of stay are described next.

Patient characteristics

The patient's health status should be the most important patient characteristic affecting the inpatient length of stay. However, reliable measures of the health status of psychiatric patients are rarely available (Macro Systems, 1986). We used discharge diagnosis and two other variables as proxies for patient health status. All of the psychiatric diagnoses were classified into 1 of 10 groups that represent a minor extension of the diagnosis-related groups. The two other health status variables are whether the patient had been previously hospitalized for a mental illness and whether the patient was involuntarily committed for treatment. The first variable is used as a surrogate measure of chronic illness. It is hypothesized to have a negative effect on length of stay because hospital lengths of stay for chronically mentally ill patients tend to be lower, the goal of the admission being to stabilize and discharge (Levin et al., 1981). In contrast, people who have been involuntarily committed may be less responsive to

treatment and may have longer lengths of stay (Schwab and Lahmeyer, 1979). The commitment itself indicates a relatively high level of severity in terms of dangerousness to oneself or others. We hypothesize that patients who leave against medical advice have shorter lengths of stay. The other patient characteristics that are expected to influence length of stay are patient age, sex, and marital status.

Hospital characteristics

Certain characteristics of the psychiatric unit and the hospital are expected to influence hospital length of stay. A special survey of psychiatric units and the hospitals in which they were located was conducted in conjunction with the patient discharge survey. Data on staffing patterns, hospital affiliation, and hospital size were obtained. Unfortunately, not all the units completed these data elements. Merging the facility survey with the patient survey led to a loss of about 20 percent of the data. Data analyses indicated that the loss of observations across States with and without limits was not random. Thus, we decided not to use any of the information on the merged data. Therefore, we were unable to explore the effects of variables such as the bed size of the hospital or unit and the hospital's teaching status.

However, the effects of two characteristics were examined. The first is whether the hospital was an integral part of a community mental health center (CMHC). It is expected that patients who are hospitalized in institutions associated with CMHC's will have shorter lengths of stay because they are likely to receive more coordinated care (Beiser et al., 1985). The second characteristic is whether the hospital has an organized psychiatric outpatient clinic. The effect of these departments on inpatient length of stay is difficult to predict a priori. On the one hand, the presence of these clinics may facilitate patient discharge because it is easier to organize followup outpatient care. On the other hand, these hospitals may attract more severely ill patients. In the first case, one would expect relatively shorter lengths of stay, but in the second case, lengths of stay would be expected to be relatively longer.

System characteristics

System variables serve to define the availability of alternative treatment settings to the hospitals. This is a particularly important class of variables for analysis of psychiatric length of stay. Because mental illness is often chronic and of considerable duration, provider decisions with respect to appropriate care are constrained by the availability of institutions, such as nursing homes and State mental hospitals, for providing care to mentally ill individuals who may not be prepared for discharge to the community. Ideally, one would want to measure the availability of these resources at a substate level. However, because of data limitations, we had to use State-level data. The system characteristics examined were the per capita number of physicians (both nonpsychiatrists and psychiatrists), State mental hospital beds, and skilled and intermediate long-term care nursing home beds. Because it is well known that lengths of stay vary regionally (Gornick, 1982), we also included the region in which the hospital was located in the set of system characteristics.

Medicaid benefit structure

As argued earlier, the Medicaid benefit structure is expected to influence patient length of stay. Compared with cost-based reimbursement, the lengths of stay should be shorter in States that set limits on the number of covered days or have per-case prospective rates and longer in States with prospectively set per diem rates. Utilization review is expected to reduce lengths of stay. Length of stay is expected to be a positive function of the physician's fee. As we did not have data on the actual fee paid to a physician for an inpatient visit, we used the average fee paid for an office visit in the State as a proxy.

Data

Data to analyze the length of stay were obtained from four sources. Data on the individual patients and psychiatric units were obtained from a national probability sample of discharges from general hospital psychiatric units sponsored jointly by the National Institute of Mental Health (NIMH) and the American Hospital Association (AHA). Data on the Medicaid benefit structure were obtained from a compilation of Medicaid reimbursement regulations published by the Health Care Financing Administration (Muse and Sawyer, 1982). Data on the number of long-term psychiatric beds certified by Medicaid and the number of physicians were obtained from the Area Resource File, a file of data on health resources by geographic region in the United States sponsored by the Department of Health and Human Services and maintained by Applied Management Sciences. Data on the number of State and county mental hospital beds were obtained from *Mental Health, United States, 1985* (Taube and Barrett, 1985). With the exception of the data from the NIMH-AHA survey, all data were for 1980.

Because the NIMH-AHA survey is not familiar to all researchers, we discuss it in more detail. The hospital discharge survey was conducted in February 1981. A stratified random sample was used, with size and ownership of hospitals being the variables on which stratification was based. Information was collected on all discharges during a 2-week period. The hospital discharge sample consisted of 5,101 discharges. A variety of information was collected on the characteristics of patients being discharged from psychiatric units. Included in the survey were questions on demographic characteristics, past psychiatric history, referral source, legal status, discharge destination, diagnosis, principal source of payment, type of services received, and some

characteristics of the hospital in which the unit was located.

The hospital discharge sample contained 1,168 Medicaid patients, the focus of this article. We reduced this number by first eliminating 81 cases that were assigned DSMII diagnoses. DSM stands for the *Diagnostic and Statistical Manual of Mental Disorders*. DSMII and DSMIII are the second and third editions of the Manual, respectively. Because the codes used in DSMII cannot be converted into either the DSMIII codes or the diagnostic categories of the *International Classification of Diseases, 9th Revision, Clinical Modification,* we could not group DSMII patients with the others in the data base. We then eliminated eight patients who had lengths of stay of more than 122 days. The outlier cutoff was set at 122 days because there was a sharp and discontinuous break in the length-of-stay distribution at that point. Missing data for key variables caused an additional 20 cases to be eliminated. The final data set contained 1,059 observations.

Descriptive statistics on the variables used in the analyses are presented in Table 1. The unit of observation used in this table is the discharge. Thus, 19.6 percent of the patients in our analytical data base were discharged from units in States that placed limits on the length of stay.

Table 1

Mean and standard deviation of selected characteristics of patients discharged from psychiatric units of general hospitals: United States, 1981

Characteristic	Mean	Standard deviation
Average length of stay in days	15.94	16.19
Physician fee level	$10.74	2.82
Medicaid program structure:	Percent	
Rate setting	31.9	—
Utilization review	29.3	—
Limits	19.6	—
Patient characteristics:		
Diagnosis—		
Organic	2.40	—
Mental retardation	1.11	—
Alcohol	5.26	—
Drug	2.31	—
Affective	22.35	—
Schizophrenia	38.87	—
Other psychotic	6.19	—
Anxiety	2.95	—
Personality	7.39	—
Preadult	2.03	—
Other	11.45	—
Age—		
15 years or under	4.25	—
16-30 years	50.14	—
31-40 years	35.92	—
41-50 years	11.45	—
51-64 years	9.05	—
65 years or over	2.59	—
Previous discharge from same hospital	57.99	—
Previous discharge from other hospital	49.77	—
Voluntary commitment	76.82	—
Male	42.11	—
Married	15.14	—
Left against medical advice	9.62	—
Hospital characteristics:		
Affiliated with community mental health center	32.78	—
Separate outpatient department	41.74	—
Region:		
Northeast	35.46	—
North Central	24.19	—
South	17.73	—
West	22.62	—

SOURCE: Department of Health Services Administration, University of Pittsburgh: Data from the American Hospital Association-National Institute of Mental Health survey of psychiatric units.

Empirical results: Regression models

We estimated equation (1) using ordinary least-squares regression. Given that the distribution of patients' lengths of stay is approximately lognormal rather than normal, the dependent variable was transformed into natural logarithms. We estimated a number of different regressions. In Table 2, we present two regressions for the basic model: They differ only with respect to the inclusion of the regional dummy variables. In Table 3, we show the effect of slight changes in the specification of the model, which included the regional dummies, on the coefficients of the Medicaid benefit structure variables. The coefficients of the other variables in the regression are not shown because these changes had no effect on them.

As with most analyses of length of stay of psychiatric patients, the estimated model accounts for only a small proportion of the variation in the length of stay of individual patients (Taube, Lee, and Forthofer, 1984). The first regression (model 1) accounts for 17 percent of the variation in the length of stay; the second regression (model 2) accounts for 19 percent. In discussing the results, we first discuss the effect of the Medicaid benefit structure, shown in both Tables 2 and 3, and then we examine the effects of the other sets of variables.

Medicaid program structure

In the first regression, only two characteristics of the Medicaid program have a statistically significant effect on length of stay, and the effect of one of them, State rate setting in Maryland and New Jersey, is not in the expected direction. However, as a result of the addition of the regional dummies in model 2, coefficients of the rate-setting variables become negative and insignificant. This shift in sign is a reflection of the fact that lengths of stay have been longer in the Northeast region, which includes the States of New Jersey and Maryland.

The effect of limits on length of stay is negative and statistically significant in both regressions. The size of this coefficient indicates that providers respond strongly to the financial incentives embedded in the setting of limits on payment. We explored this relationship in somewhat more detail. First we

Table 2

Coefficients and *t* statistics of length of stay for patients discharged from psychiatric units of general hospitals, by model and selected variables: United States, 1981

Variable	Model (1) excluding region		Model (2) including region	
	Coefficient	*t* statistic	Coefficient	*t* statistic
Intercept	2.18	4.46	2.85	4.7
System characteristics:				
State mental hospital beds per capita	115.62	.67	−370.57	−1.6
Federal community mental health center beds per capita	−14.62	−.25	−1,177.88	−1.8
General hospital beds per capita	138.74	1.36	−.47	.0
Other mental health beds per capita	213.85	.25	−1.84	−1.7
Psychiatric nursing home beds per capita	−8.39	.26	−22.83	−.6
Physician nonpsychiatrists per capita	14.96	.05	443.16	1.2
Psychiatrists per capita	−1,056.67	−.46	1,194.06	1.1
Medicaid program structure:				
Rate setting, per diem	.19	1.49	−.02	−.0
Rate setting[1]	.32	2.04	−.13	−.7
Utilization review	−.13	−1.09	−.00	−.0
Limits	−.30	−2.18	−.35	−2.2
Physician fee level	.00	.14	.02	1.1
Patient characteristics:				
Diagnosis—				
Organic	−.23	−1.18	−.24	−1.1
Mental retardation	−.28	−1.01	−.34	−1.2
Alcohol	−.83	−5.96	−.80	−5.7
Drug	−.70	−3.97	−.76	−3.8
Affective	−.19	−2.23	−.19	−2.3
Other psychotic	−.50	−3.65	−.45	−3.2
Anxiety	−.39	−2.07	−.39	−2.0
Personality	−.41	−3.41	−.42	−3.5
Preadult	−.09	−.36	−.02	−.1
Other	−.53	−4.93	−.54	−5.1
Age—				
15 years or under	.48	2.64	.48	2.6
16-30 years	−.02	−.24	−.03	−.4
41-50 years	.03	.30	.02	.2
51-64 years	.20	1.70	.19	1.6
65 years or over	−.01	−.04	.00	.0
Previous discharge	−.14	−1.87	−.15	−1.8
Voluntary commitment	.04	.56	.03	.4
Male	−.12	−1.92	−1.29	−2.0
Married	.00	−.01	.00	−.0
Left against medical advice	−.57	−5.63	−.58	−5.7
Hospital characteristics:				
Affiliated with community mental health center	−.30	−4.34	−.30	−4.3
Separate psychiatric outpatient department	.19	2.87	.19	2.9
Region:				
North Central	—	—	−.03	−.1
South	—	—	−.08	−.6
West	—	—	−1.08	−3.6
Adjusted R^2	.17	—	.18	—

[1]New Jersey and Maryland.

SOURCE: Department of Health Services Administration, University of Pittsburgh: Data from the American Hospital Association-National Institute of Mental Health survey of psychiatric units.

separated States with limits into those States with limits per admission or per stay of less than 25 days and those with limits per admission or per stay of 25 days or more and reestimated the equation. As shown in Table 3, the coefficient for limits on stays of less than 25 days was −.41 and statistically significant; that for limits on stays of 25 days or more was positive but not statistically significant. These results are consistent with the hypothesis that the response will be greater if the limits are lower.

Although the coefficient of the level of the Medicaid physician fee was zero, we tested the hypothesis that the level of the Medicaid fee schedule would attenuate the effect of limits on length of stay. We tested this hypothesis by classifying the States with limits into three groups, depending on their fee schedule. The three fee-schedule groups were less than $10, $10-$12, and more than $12. (These groups divided the fee distribution across the observations into thirds.) The statistical results, which are shown in Table 3, are not consistent with our hypothesis. The decrease in length of stay was lowest in the States with the highest fee; however, the decrease in States with the middle range of fees was greater than that in States with the lowest fees.

Table 3

Coefficients of length of stay for patients discharged from psychiatric units of general hospitals for model (2), by model assumptions and selected Medicaid program characteristics: United States, 1981

Medicaid program characteristic	Model (2)	Model (2) plus limits model	Model (2) plus physician fee limit interaction	Model (2), all cases
Rate setting per diem	−.02	.20	.01	−.04
	(−.08)	(.96)	(.05)	(−.19)
Rate setting[1]	−.13	.11	−.11	−.04
	(−.72)	(.61)	(−.62)	(−.22)
Utilization review	−.00	.07	−.02	.08
	(−.00)	(.51)	(−1.03)	(.54)
Limits	−.35	—	—	−.45
	(−2.25)			(−2.75)
Physician fee level	.019	.014	1.01	.018
	(1.13)	(.89)	(.74)	(1.02)
Stay limit of 25 days	—	−.41	—	—
		(−2.59)		
Stay limit of 25-60 days	—	.29	—	—
		(1.18)		
Medicaid physician fee level:				
Less than $10 × limit	—	—	−.35	—
			(−1.58)	
$10-$12 × limit	—	—	−.46	—
			(−2.22)	
More than $12 × limit	—	—	−.21	—
			(−.89)	

[1]New Jersey and Maryland.

NOTE: *t* statistics are shown in parentheses.

SOURCE: Department of Health Services Administration, University of Pittsburgh: Data from the American Hospital Association-National Institute of Mental Health survey of psychiatric units.

Finally, one further observation lends support to the hypothesis that the existence of limits is associated with strong provider response. As indicated earlier, discharges with lengths of stay longer than 122 days were excluded from the data base because they were outliers and could be the result of coding errors. However, we reestimated model 2, including them in the data base. As shown in Table 3, the coefficient of the limit variable increases. These results suggest that limits may be associated with a decrease in the number of patients with extremely long stays.

Patient characteristics

Many of the patient characteristic variables have significant effects on the length of stay. Patients with schizophrenia (the excluded variable) and patients with a preadult diagnosis (a diagnosis specific to children, e.g., conduct disorder) have the longest lengths of stay; patients with alcohol and drug diagnoses have the shortest lengths of stay. As hypothesized, patients who had a prior hospital admission have shorter lengths of stay than those for whom this is a first admission. The length of stay of males is shorter than that of females, a result that is consistent with most length-of-stay literature. Surprisingly, the length of stay of people who are married is not different from that of people who are not married. Patients under 15 years of age have the longest length of stay. There are no significant differences in the length of stay in the other age groups. Finally, people who leave against medical advice have significantly shorter lengths of stay.

Hospital characteristics

The two hospital characteristics included in the model are significantly related to length of stay. Patients who are cared for in hospitals with organized psychiatric outpatient departments stay significantly longer than those who are hospitalized in hospitals without such departments. This may result from more severe illnesses in these patients. The length of stay in units in hospitals affiliated with a CMHC is significantly shorter. The results suggest that the formalized association of the hospital and the CMHC facilitates discharge.

The *t* statistics for continuous hospital and system variables are overstated because they are assigned to a patient record, which means that the sample size used for calculating *t* tests is larger than the actual number of observations. However, because both hospital variables are dummies, this is not a relevant concern. Virtually none of the estimated coefficients of the system variables is significant even with the inflated *t* statistics. Finally, the sample is not a simple random sample. However, the inclusion of variables that form the hospital strata eliminates essentially all the design effects.

System characteristics

The system characteristics have no significant effect on the length of stay. Although we can conclude only

that, in the context of the estimated model, the system variables are not important, we believe that more work should be done in exploring the effect of the system in which care is provided.

Survival analysis

Most analyses of the effects of reimbursement policies on hospital length of stay have been focused nearly exclusively on the estimated impacts evaluated at the mean of the distribution. We are interested in expanding this focus to include the entire length-of-stay distribution. This is an important step to take because the clinical status of patients discharged at various points of the length-of-stay distribution has been shown to vary substantially (SysteMetrics, Inc., 1984). We therefore present a descriptive analysis of how time to discharge varies by payment method, using a nonparametric approach. For example, in comparing the lengths of stay of two groups of patients (one of which is subject to limits on reimbursable days), the average length of stay of the patients subject to limits could be reduced either because the length of stay of some patients who otherwise could have exceeded the limits is reduced or because the presence of limits leads to a systematic reduction in all lengths of stay.

The duration of an episode of hospital care is measured by the length of stay. The probability distribution of length of stay can be specified by the distribution function

$$F(d) = \Pr(D < d), \qquad (2)$$

which indicates the probability that the variable D is less than some specific length of stay d. The density function is $f(d) = dF(d)/dd$. We are concerned with the survival function, which is defined as

$$S(d) = 1 - F(d) \qquad (3)$$

and is the probability that D exceeds a particular length of stay d. Alternatively, we can define the hazard rate (with the hazard in this case being discharge from the hospital) as $\lambda(d) = f(d)/S(d)$, where $\lambda(d)$ expresses the rate at which discharges occur at length of stay d. In this analysis, we focus on the manner in which S(d) varies with reimbursement policies. Thus, we seek to estimate S(d) under varying reimbursement policies. In particular, we compare the survival distributions for Medicaid psychiatric patients in States with and without limits on reimbursable days.

The hazard rate can be estimated by

$$\lambda(d_j) = h_j/n_j, \qquad (4)$$

which is the number of discharges at length of stay d_j divided by the number of patients who could potentially be discharged at length of stay d_j. The corresponding survival function estimator is

$$S(d_j) = \prod_{i}^{j} (n_i - h_i/n_i) = \prod_{i}^{j} (1 - \lambda_i). \qquad (5)$$

This estimator is known as the Kaplan-Meier, or Product Limit, Estimator (Kalbfleisch and Prentice, 1980). The estimator is nonparametric in that no distributional assumption is made about F(d) or S(d). We evaluate the survival function in two ways. First, we stratify length of stay by reimbursement method (limits versus no limits). Second, we stratify by age, sex, race, and reimbursement status. In both cases, we assess the observed differences using a Wilcoxon rank test for equality over strata (Mood, Graybill, and Boes, 1974). The results reported are focused on differences by reimbursement stratum.

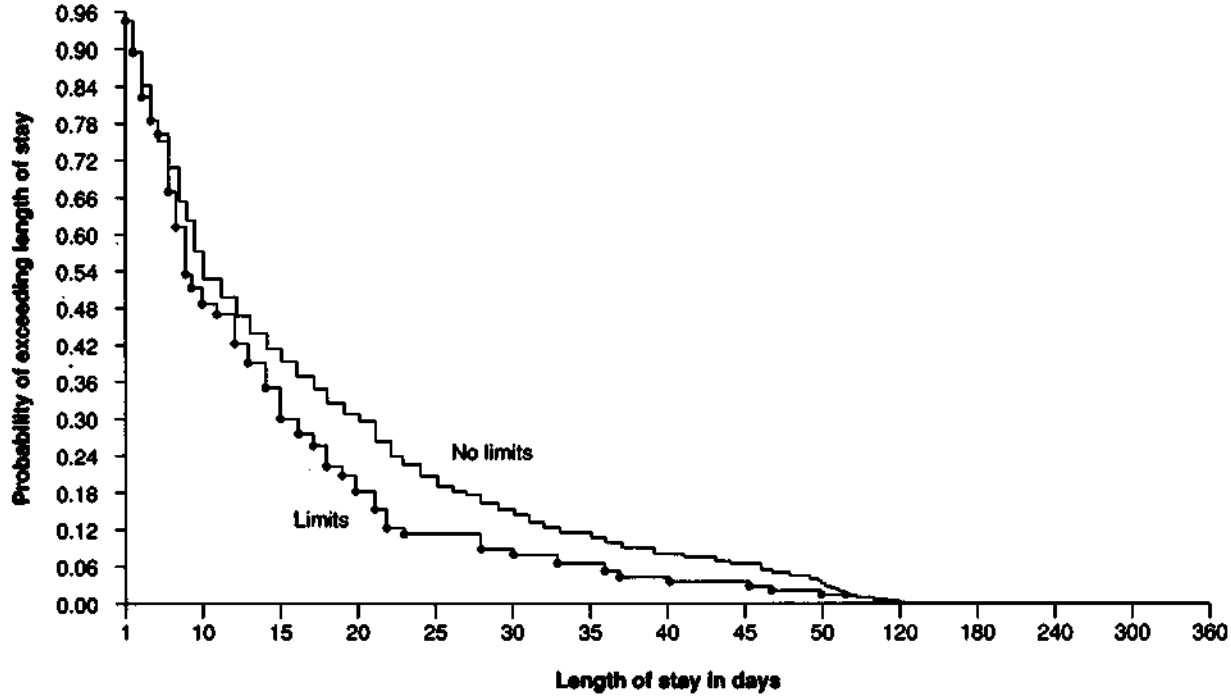
In Figure 1, we present the Kaplan-Meier plots for the survival function, $S(d_j)$. Consistent with the regression results, the survival function for patients treated in States with Medicaid limits on reimbursable days lies below the survival function for patients in States where there are no limits. This means that the probability of exceeding any given length of stay, d_j, of more than 10 days is lower for patients in States with limits. This is illustrated by the display of quartiles in Table 4. At the 25th percentile of the length-of-stay distribution, patients in States with limits have longer stays than those in States without limits. However, at the 50th and 75th percentiles of the distribution, stays are shorter in States with limits. In Figure 1, we show that the impact of limits on length of stay grows until lengths of stay of approximately 25 days (about the 85th percentile of the pooled distribution). As shown in Figure 1, the differences in the survival probabilities remain constant from the 25th through the 45th days. This is consistent with Table 4, in which the largest differences in the two distributions can be seen at the 75th percentile.

The Wilcoxon test for equality over strata has a chi square value of 3.38, which is significant at the 0.06 level. This implies that the two estimated survival distributions are significantly different from one another. The significance of the chi square statistic for differences across reimbursement strata persists when age, sex, and race strata are taken into account. The differences between the two populations at the means are significant at the 5-percent level (using a *t* test). At the extremes of the distributions, it is difficult to draw firm inferences from the estimated survival functions because the number of observations becomes very small.

Finally, the estimates of survival function seem to suggest that the Weibull distribution may be a functional form that is useful for modeling length of stay. The Weibull distribution is also convenient because of the implicit assumption that all cases will be discharged eventually. In sum, the nonparametric analyses reported here suggest two main findings: that limits affect the overall length-of-stay distribution and that limits affect the distribution unevenly.

Figure 1

Kaplan-Meier plot of length of stay of patients discharged from psychiatric units of general hospitals: United States, 1981



SOURCE: Department of Health Services Administration, University of Pittsburgh: Data from the American Hospital Association-National Institute of Mental Health survey of psychiatric units.

Table 4

Length of stay for patients discharged from psychiatric units of general hospitals, by presence of Medicaid program limits on reimbursable days and quartile: United States, 1981

Quartile	No limits	Limits
	Length of stay in days	
Mean	18.19	15.26
75 percent	22.00	18.00
50 percent	11.00	10.00
25 percent	5.00	6.00

NOTE: In the Wilcoxon test for equality over strata, the chi square = 3.38 with $p < 0.06$.

SOURCE: Department of Health Services Administration, University of Pittsburgh: Data from the American Hospital Association-National Institute of Mental Health survey of psychiatric units.

Summary and conclusions

The length-of-stay model that we explore in this article, like other length-of-stay models, accounts for a significant but relatively small proportion of the variation in length of stay across patients discharged from a psychiatric unit of a general hospital. The small proportion of variation accounted for indicates that, although groups of patients and hospitals are different in the aggregate, the data that have so far been available are insufficient to account for the individual differences in the patients within each group and the providers that treat them.

We used a length-of-stay model to explore provider response to incentives in payment systems. The results indicate that the providers of care in psychiatric units react strongly to the financial incentives facing the institution. We estimate that average length of stay of Medicaid patients covered by limits is about 32 percent shorter than that of patients who are not. This is a large difference. We used a similar approach to examine the effect of PPS on the length of stay of psychiatric patients who were discharged from hospitals that did not have psychiatric units. We found that the length of stay fell about 12 percent after the hospitals came under PPS (Frank et al., 1987). This means that the response of providers of care in psychiatric units to Medicaid payment incentives is larger than the estimated response of psychiatric care providers to the implementation of the Medicare prospective payment system. Thus, we conclude that psychiatric units are at least as responsive to financial incentives as are other providers of inpatient psychiatric care.

We found that the level of Medicaid physician fees does not have an effect on the length of stay. Although the results of this preliminary effort to look at the interaction between physician reimbursement and limits are inconclusive, we believe that it is an important area for future research. We also found that people with prior inpatient stays had shorter than average lengths of stay. This latter group represents

almost 10 percent of the Medicaid population discharged from psychiatric units. The size of this population may pose some interesting problems for prospective payment systems.

Hospital characteristics also had important effects on length of stay. It is interesting that the existence of an outpatient department has a significantly positive association with length of stay. This result suggests that patients in units in hospitals with outpatient departments may be significantly sicker than those in other hospitals. Finally, the length of stay of patients in units affiliated with community mental health centers is significantly shorter than that of patients treated in unaffiliated units. This result suggests that association with an integrated mental health system facilitates discharge.

In this study, the system variables were found not to affect length of stay. However, data problems precluded a detailed investigation of their effect. This is an area to be pursued further.

As with many studies of this sort, the implications of the findings are hard to assess. We have established that providers respond to financial incentives, but we do not know what this response means for patient outcomes. The evidence to date on this issue is mixed. The work by Rupp, Steinwachs, and Salkever (1984) suggests that readmissions may increase in response to payment system constraints. Similarly, Frank and Lave (1985) provide some evidence that, because of payment policy, patients in States with limits are more likely than patients in other States to be discharged to State mental hospitals. However, work by Systemetrics, Inc. (1984), suggests that patients are no longer acutely ill at the end of a hospital stay. This suggests that lengths of stay could be reduced without adverse effects. Understanding the impact of payment system changes on patient outcomes is clearly the most important issue for rendering a judgment as to the value of different payment policies.

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