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**Why Are Hospital-  
Based Nursing Homes  
So Costly?**

**The Relative  
Importance of Acuity  
and Treatment Setting**

**Health Services  
Research and  
Evaluation (HSRE)**

**Working Paper  
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**Objectives.** To determine the extent to which higher costs in hospital-based skilled nursing facilities (HBSNF) can be explained by observable resident characteristics and unobservable selection effects, implying a design shortcoming of the skilled nursing facility prospective payment system (SNF PPS) implemented for Medicare-covered stays by the Balanced Budget Act of 1997 (BBA 1997).

**Research Design.** Data on resident characteristics from the Minimum Data Set (MDS) are combined with staff time costs from HCFA's 1995 and 1997 SNF Staff Time Measurement (STM) studies and non-therapy ancillary claim costs extracted from HCFA SNF claim records. We estimate an endogenous switching model to measure the effect on costs of the relatively high acuity of HBSNF residents, net of differences purely attributable to the treatment setting.

**Results.** We find that virtually the entire HBSNF differential is attributable to setting effects with resident characteristics and selection effects playing a negligible role. In addition, we find that marginal costs associated with particular services and conditions are often lower in hospital-based than in freestanding facilities.

**Conclusions.** HBSNFs incur high costs regardless of the characteristics of their residents. Their high fixed costs accompany relatively low marginal costs associated with admitting high-acuity residents. Consequently, a PPS casemix system that depends on resident characteristics and excludes consideration of facility characteristics (as mandated by BBA 1997) need not unfairly penalize HBSNFs, provided a powerful casemix system is used and HBSNFs specialize in the care of high-acuity residents.

## INTRODUCTION

The Balanced Budget Act of 1997 (BBA) directed the Health Care Financing Administration (HCFA) to implement a prospective payment system (PPS) for skilled nursing facilities (SNFs). The phase-in of this system began in July of 1998 and is ongoing, amid substantial debate regarding payment methodology. As directed by Congress, HCFA implemented a payment system based solely on resident characteristics, excluding from

consideration the characteristics of facilities providing care. Yet differences in facility characteristics are well-known to be associated with variations in cost. For-profit or nonprofit status, ownership by a multi-facility chain, and number of beds are commonly included in models estimated in the literature.<sup>1,2,3</sup> In addition, the substantial growth of hospital-based skilled nursing facilities (HBSNFs) prior to BBA raises questions about the potential cost implications of admitting a resident to such a facility.<sup>4</sup>

This article explores whether these characteristics remain related to costs within the context of the most statistically powerful casemix system available. We focus attention on the differential between HBSNFs and freestanding facilities, since it is by far the largest, and evaluate the empirical validity of the two principal explanations for its existence.

One explanation for the HBSNF differential is that it simply costs more to perform the same task in the same way in a HBSNF than in a freestanding facility. This “treatment setting effect” would be generated directly by characteristics of the facility such as higher overhead, higher average skill levels, or stronger employee organizations among other reasons. An alternative explanation rests on the degree of illness and infirmity of the residents. Since residents in HBSNFs typically require more acute care than those in freestanding facilities, if the casemix system does not completely adjust for acuity then HBSNFs would have unexplained higher costs relative to freestanding facilities. The American Hospital Association expressed this concern in their official comments regarding the implementation of SNF-PPS (Pollack, R., Executive Vice President, American Hospital Association, “Letter to Health Care Financing Administration Administrator regarding HCFA-1913-FC; Medicare Program, Changes to the Hospital Inpatient Prospective Payment Systems and Consolidated Billing for Skilled Nursing Facilities,” July 9, 1998). This “selection effect” explanation argues that the differential is generated by nonrandom selection into HBSNFs of residents with unmeasured or unobservable individual characteristics that lead to high costs. Although the resulting differential is the same, one might argue that a facility could try to reduce setting effects without harming patient care, whereas selection effects could not be reduced without sending medically infirm residents

elsewhere.

We employ a switching regression framework to explicitly model the choice between HBSNF and freestanding facility and to estimate any selection effects. We find that practically the entire differential is accounted for by setting effects. We also find, however, that the added cost associated with some acute conditions or special treatments is lower in a HBSNF than in a freestanding facility. We conclude that HBSNFs may carry higher fixed costs in part to maintain a permanent capacity to care for certain acute conditions. We also note that any systematic differences in quality of care would be unmeasured in this analysis.

## DATA

To begin our analysis two types of data are required. The first is a measure of the resources required to provide Medicare-covered services to nursing home residents. The second is information on resident characteristics, so that the relationship between costs and characteristics can be measured.

The HCFA Staff Time Measurement (STM) study data (1995 and 1997) measure the amount of nursing and therapy time required to care for nursing home residents from a sample of 154 nursing facilities studied in 1995 and 1997. A detailed description of how these data were gathered is published in the Federal Register.<sup>5</sup>

The STM database, when merged with the resident's MDS assessment, includes information on resident characteristics based on the Minimum Data Set version 2.0. The MDS assessment includes more than 350 items that can be used by facilities in performing comprehensive assessments of their residents. MDS data are collected by trained facility nurses who assess each MDS item based on input from the resident, medical records, other facility staff, and family or friends. Topics covered include diagnoses and medical conditions, skin condition, cognitive status, communication, hearing, vision, behavior problems, nutrition and diet, functional status, continence, and special treatments and services received.

In addition to staff time, facilities incur costs for non-therapy ancillary services. Non-therapy ancillary charges cover such things as drugs, supplies, and laboratory services that are directly attributable to individual residents. We use Medicare Part A and Part B claims data to measure the *per diem* charges for non-therapy ancillary services for residents in the STM study population. To process and adjust the non-therapy ancillary charge data extracted from Medicare SNF claims we follow procedures also described in detail in the Federal Register.<sup>6</sup>

Not all individuals in the STM study file had a Medicare-covered nursing home stay at the time of the staff time measurement study (i.e., not all residents were reimbursed under Medicare). Because Medicare claims are the data source for ancillary charges, individuals who cannot be linked to a Medicare Part A SNF claim (either because the individual did not have a Medicare-covered SNF stay at the time of the staff time study, because the resident was enrolled in a risk-based managed care plan or because of invalid beneficiary identifiers in the STM file) are excluded from our analyses.

We were able to find a valid Medicare HIC number for 89 percent (3,481) of the 3,933 records in the STM file. Overall, 2,273 of these individuals had one or more Medicare-covered SNF stays between 1993 and 1997, and 1,304 had a Medicare Part A SNF claim that covered a date within 15 days of the STM study week. This is the sample used for our analysis.

#### *Creating a measure of total cost*

Because previous studies that used STM data considered only staff time costs and did not use data on non-therapy ancillary charges, they used relative (and therefore unitless) weights in constructing a measure of the total costs of caring for residents.<sup>7,8</sup> In order to aggregate staff time costs and ancillary charges for this study, it is necessary to value staff time in terms of actual dollars rather than relative weights. To do this, individual time measures are weighted by occupation-specific mean wages from the Bureau of Labor Statistics. This information is used to calculate the cost per minute of different types of staff, based on the assumption that staff work 2,080 hours per year.

In addition to wage costs, providers are responsible for fringe benefits and taxes. According to the Bureau of Labor Statistics, 24.3 percent of total compensation for nursing home employees consisted of paid leave, supplemental pay, insurance, retirement and savings, and legally required benefits.<sup>9</sup> Failure to account for these staff time-associated costs would result in a measure of total cost that overemphasizes ancillary charges. If wages and salaries constitute 75.7 percent of total compensation, then total compensation is 1.32 times larger than wage cost alone ( $1/0.757=1.32$ ). We therefore inflate our measures of wage cost by a factor of 1.3 to account for the additional staff time costs associated with fringe benefits.

Our specification of total costs includes all staff time-related costs, non-therapy ancillary charges, and the \$55.88 non-case-mix component of the (1998) Federal payment rate, which is assumed to cover capital-related costs. Capital-related costs include the costs of land, building, equipment, and the interest incurred in financing the acquisition of such items. To emphasize that not all components of total cost are directly measured, we use the term “total observed cost” for the remainder of the article.

Finally, to evaluate the importance of facility characteristics, we obtain information on ownership status (for profit/nonprofit, chain affiliation, hospital-based) and number of beds for each facility from the SNF Provider of Service (POS) files from 1995 and 1997 and merge these data with the files used to develop cost estimates.

As indicated by the top panel of Table 1, there are 1,304 resident assessments represented in the data with an average daily total observed cost of \$235. Roughly one-quarter (350) of those assessments were provided by hospital-based facilities at an average cost of \$294, \$81 higher than the average for freestanding facilities.

Roughly two-thirds of resident assessments were provided by for-profit facilities, and a similar number were provided by chains. Nonprofit and chain facilities had higher costs on average than their for-profit and independent counterparts, but the differentials were smaller than the hospital-based differential: \$20 for nonprofits and \$11 for chains. Consequently, we focus attention on the hospital-based differential.

To examine possible interactions among these characteristics, the bottom panel of Table 1 contains frequencies and average costs by combinations of characteristics. For example, the upper left-hand cell in the top-half of the panel contains the average cost (\$170) and number of resident assessments (154) for freestanding, independent, nonprofit facilities. Likewise, the upper left-hand cell in the bottom half of the panel contains average cost and frequency for hospital-based, independent, nonprofits. The table indicates that by far the most costly group of assessments were supplied by for-profit hospital-based facilities, all of which were chains. While the mean cost for this group was extremely high at \$426, there were only 22 assessments in this category, making its impact on the overall hospital-based differential small. By contrast, affiliation with a chain did not imply a large difference in cost for HBSNFs. Among freestanding facilities, nonprofits were most often independent and for-profits were most often affiliated with chains. Independent for-profits had higher average costs than nonprofits but nonprofit chains had higher costs than for-profits.

## METHODS

Although these averages are sufficient to direct our attention to the hospital-based differential, they do nothing to determine whether any of these differentials were generated by systematic differences in casemix, differences in overhead or other setting effects, or both. To begin to unravel these effects, regression techniques are required. As a first step we might estimate a regression model based on a statistically powerful casemix system and add facility characteristics to the specification. From the standpoint of statistical power only, the best casemix model available is the total cost index model developed by White et. al. (White, A., S. Pizer, C. White, and T. Moore. "Refining Resource Utilization Groups (RUG-III) for a National Skilled Nursing Facility System." Technical Expert Panel Briefing Materials prepared for the Health Care Financing Administration, October 1, 1998). This model consists of 15 variables deployed in an OLS regression. On our sample, the total cost index model achieves an R-squared of 0.37, compared to 0.10 for the current SNF casemix system (RUG-III). Since the

total cost index model is a variant of the nontherapy ancillary cost index model described in the Federal Register,<sup>6</sup> details on its development are not provided here.

In the following equation, X denotes the vector of 15 variables included in the total cost index model; Dchain, Dprofit, and Dhosp denote dummy variables indicating whether the resident-day was supplied by a chain, a for-profit, or a HBSNF, respectively; Beds represents the total number of beds in the relevant facility;  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$ ,  $\alpha_4$ , and the vector  $\beta$  are parameters to be estimated; and  $\epsilon$  is the regression residual.

(1) 
$$\text{Total Observed Cost} = X' \beta + \alpha_1 \text{Dchain} + \alpha_2 \text{Dprofit} + \alpha_3 \text{Beds} + \alpha_4 \text{Dhosp} + \epsilon$$
The estimated coefficients on Dchain, Dprofit, Dhosp, and Beds will indicate whether these facility characteristics are still associated with cost after differences in casemix have been accounted for. The estimated coefficient on beds will also indicate whether SNFs exhibit increasing returns to scale, achieving lower unit costs in larger facilities.

The regression specified by equation (1) estimates how much of the HBSNF differential remains after adjusting for casemix, but there may be additional factors, some of them unobservable, that influence both cost and treatment setting. Suppose that hospital discharge planners decide whether each patient will be discharged to a HBSNF or a freestanding facility. These planners would consider everything they know about a patient, including factors not recorded on the patient's MDS assessment. If some of these unobservable factors promote referral to a HBSNF and are also correlated with high cost, then the estimate of  $\alpha_4$  in equation (1) will be a biased estimate of the setting effect, capturing as well some of the effects of these unobserved individual characteristics.

To control for these unobserved selection effects, we model the discharge planner's choice between HBSNF and freestanding facility simultaneously with the impact of facility characteristics. Equation (2) models the choice of setting with Dhosp equal to 1 if the resident was treated in a HBSNF and 0 if the facility was freestanding.

$$(2) \sim Dhosp \sim Z' \gamma + \nu_1$$

Z denotes a vector of MDS variables selected

$$(3) \sim Total \sim Observed \sim Cost \sim X' \beta + \alpha_1 D_{chain} + \alpha_2 D_{profit} + \alpha_3 Beds + \alpha_4 E(\nu_1 | Dhosp) + \nu_2$$

because they are correlated with treatment in a

HBSNF,  $\gamma$  is a vector of parameters, and  $\nu_1$

represents unobservable factors. Since Dhosp

only takes on values of 0 and 1, we estimate equation (2) by probit techniques. Equation (3) is

similar to equation (1) except that it is estimated separately for HBSNFs and freestanding

facilities; consequently the dummy variable for HBSNFs is removed and a new term is added to

capture the effects of unobservables from the selection equation. This term is written

$E(\nu_1 | Dhosp)$ , denoting the expected value of  $\nu_1$ , conditional on the value of Dhosp. Since

equation (3) is estimated separately for two regimes based on the choice modeled in equation (2),

this estimation strategy is known as a switching regression framework.<sup>10</sup>

We employ a two-step technique whereby the probit given by equation (2) is estimated first, then  $E(\nu_1 | Dhosp)$  is calculated using the parameters from the probit, and equation (3) is estimated by Ordinary Least Squares (OLS). Because  $E(\nu_1 | Dhosp)$  is an estimated quantity in the second step, the OLS standard errors are incorrect. We therefore bootstrap the standard errors in the second step taking the stochastic nature of the first step into account.

Once this procedure is complete, the portion of the HBSNF differential attributable to selection effects can be calculated by taking the difference at the mean between  $\alpha_4 E(\nu_1 | Dhosp)$  for hospital-based and freestanding facilities. The pure setting effect is given by the difference in constant terms as well as differences in chain and for-profit ownership effects calculated at the mean observation for each group. Since the two types of facilities might have different average sizes, differences in returns to scale ( $\alpha_3$ ) times mean number of beds could also be interpreted as a setting effect. Differences in  $X'\beta$  have a less straightforward interpretation. Differences in X are due to casemix by definition, but differences in  $\beta$  reflect a combination of facility and individual differences. To be conservative, we interpret these differences to be the result of casemix only, minimizing the estimated setting effect.

## RESULTS

To implement the switching regression specification given by equations (2) and (3), the first step was to develop a model to explain the choice between HBSNF and freestanding facility. This model is of the form given by equation (2) with Dhosp, the dummy variable indicating treatment in a HBSNF, as the dependent variable.

To identify independent variables for this equation, a systematic search of MDS variables was conducted. First, all MDS characteristics were tested in a univariate context by comparing mean values of Dhosp for those with and without the characteristic. In this framework, the mean value of Dhosp gives the proportion of residents treated in a HBSNF. If the difference in mean values was significant at the 5% level, the variable was included in the second step. This step consisted of a stepwise logit where variables were discarded iteratively if they failed to be significant at the 10% level. The resulting list of variables were used to estimate equation (2) by probit methods. As shown in Table 3, this model employed 59 variables and achieved a pseudo R-squared of 0.62.<sup>11</sup>

The first column of Table 3 contains estimated coefficients and standard errors; the second column contains marginal probability effects. Comparing marginal effects reveals the variables to which the selection equation was most sensitive. For example, variables that increased the likelihood of discharge to a HBSNF included paraplegia, dressing does not occur (the resident does not get dressed, regardless of assistance from staff), locomotion off unit does not occur, radiation, suctioning, IV medication, transfusions, and antibiotic resistant infection. Variables that reduced the likelihood of discharge to a HBSNF included receipt of nursing rehabilitation transfer assistance, receipt of nursing rehabilitation eating assistance, receipt of occupational therapy, the presence of a feeding restriction, and the use of a pressure relieving device.

These results are consistent with the theory that acutely ill patients who need skill- and equipment-intensive treatment are more likely to be in a HBSNF, whereas patients in a position to benefit from therapy or in need of longer term care and supervision are more likely to be discharged to a freestanding facility.

The next step in the switching regression framework is to estimate equation (3) by OLS, once for those treated in HBSNFs and again for those in freestanding facilities. Each regression includes a bias correction term calculated from the parameters of the selection equation. Estimates from both samples are shown in Table 2 with the HBSNF sample in the second column and the freestanding sample in the third column.

These estimated coefficients indicate that important differences exist between HBSNFs and freestanding facilities with regard to the marginal costs associated with a variety of treatments and conditions. What may be surprising is that these marginal costs were frequently lower in the HBSNFs. This was true for no locomotion on unit combined with bedfast and ineffective breathing; weight change combined with IV medication; and for IV medication by itself. In addition to differences in casemix parameters, the switching model identifies large differences in the effects of chain membership and for-profit status. Chain affiliation and for-profit status had large positive effects on costs for HBSNFs, and small effects on freestanding facilities, failing to be significant in the case of chain affiliation.

To determine how much each of these coefficient differences contributed to the HBSNF differential, we decompose the average differential into the sum of products of coefficients and mean variable values. This decomposition is carried out in Table 4. The bottom row of Table 4 contains column sums; the column sum for the column labeled “HBSNF b\*mean value” is the overall mean total observed cost for HBSNFs, \$294. Each row of that column gives the component of the overall mean attributable to the variable labeled in the left column. Thus, \$196 of the HBSNF mean is attributable to the constant term. Likewise, \$7 of the HBSNF mean is attributable to the for-profit effect; this may seem small given the large (107) coefficient on Dhosp, but only 6% of HBSNF days were in for-profits (the mean of Dprofit for HBSNFs) so the large coefficient had a small impact.

The final results of this decomposition are found in the last two columns of Table 4. The column labeled “Difference” contains the actual differential, decomposed by variable, and the column labeled “Proportion of Total Diff” expresses these differences as proportions of the total

HBSNF differential.

The most salient result is that almost three-quarters (74%) of the differential is attributable to differences in the constant term. Since this is related to neither casemix nor selection, we interpret this difference to be due to setting effects such as overhead, wage rates, and so on.

The next largest component, at -39%, is accounted for by days of occupational therapy (OT). The HBSNFs in the sample provided fewer days of OT on average (1.9 compared to 2.8), and the switching model indicates that an extra day of OT was associated with slightly lower costs in HBSNFs and higher costs in freestanding facilities (-0.97 and 10.57, respectively). This negative coefficient was probably observed because patients in good enough health to receive OT had lower costs than the average HBSNF resident. This component cannot be interpreted as unambiguously individual- or facility-specific, and is likely to be a combination of both. Nevertheless, if we assume that it is entirely individual-specific, it suggests that the HBSNF differential should be negative, the opposite of the expected impact of casemix.

At 23% and 14% respectively, chain affiliation and number of beds are unambiguously facility-specific, and we interpret these components to be setting effects. The beds effect stems from the fact that freestanding facilities are larger on average, 190 vs. 65 beds, so even though economies of scale are the same in both types of facilities, freestanding SNFs have lower costs. The chain effects suggest that affiliation with a chain means different things for HBSNFs and freestanding facilities. There may be differences in management style associated with chain affiliation for freestanding SNFs, whereas chain affiliation may be more associated with differences in mission for HBSNFs.

Several casemix factors did contribute to the differential. Injections (13%), IV medications (9%), fluid intake by IV (9%), and incision or soft tissue pain (7%) were the most important. Surprisingly, pure selection effects only accounted for 4% of the differential.

The most conservative way to estimate setting effects is to add up the unambiguously facility-specific effects (chain, for-profit, beds, and constant term) and interpret the rest as

potentially individual-specific. This approach implies that 103% of the differential was due to the setting effect. Casemix and selection effects taken together actually reduced costs in HBSNFs, making the differential smaller than it would have been with identical casemix.

## DISCUSSION

This article evaluates the importance of facility characteristics-- for-profit ownership, chain affiliation, number of beds, and hospital-based-- in the determination of *per diem* costs for a sample of SNF residents. By far the most important of these characteristics was whether the facility was hospital-based; HBSNFs had mean total observed costs \$81 higher than their freestanding counterparts. We use a switching regression framework to control for possible selection bias and to decompose the HBSNF differential into facility-specific (setting effects) and individual-specific (casemix and selection effects) components. This approach indicates that setting effects accounted for more than 100%, with casemix and selection effects on the whole having a small negative effect on the differential.

These two findings indicate that average costs for HBSNF residents are higher primarily because they are in a HBSNF, not because their condition is more acute. This does not mean that the higher costs are unjustified. The fact that marginal costs associated with particular conditions or treatments are often lower in a HBSNF suggests that this may be because HBSNFs are equipped and staffed to care for acutely ill patients, regardless of their actual casemix. While higher acuity residents cost more, the increases are often lower than at freestanding facilities where additional specialized staff and equipment may be needed on a case-by-case basis. This implies that HBSNFs will do best under PPS by specializing in the care of the high-acuity residents for whom they are already staffed and equipped.

Two important qualifications should be kept in mind when interpreting these results. First, although we use the best available data and the most powerful casemix adjustments, our sample size is limited and all casemix models are imperfect. It is also possible that data elements not included on the MDS version 2.0 would yield different results. Second, it should be noted

that some of the additional cost of treatment in a HBSNF may reflect systematic differences in quality of care. Consequently, the economic considerations evaluated in this article should be combined with clinical factors when considering the net value of treatment in HBSNFs.

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**Table 1. Facility Characteristics, Number of Resident Assessments, and Average Total Observed Daily Cost**

	Number of assessments	Average total observed cost
All facilities	1,304	\$234.56
Hospital-based	350	\$293.69
Freestanding	954	\$212.87
Nonprofit	534	\$246.12
For-profit	770	\$226.54
Chain	807	\$239.02
Independent	497	\$227.31

**Freestanding Facilities**

	Nonprofit	For-profit
Independent	\$170.32 <sup>†</sup> 154	\$232.11 182
Chain	\$226.77 52	\$216.98 566

**Hospital-based Facilities**

	Nonprofit	For-profit
Independent	\$276.40 161	- 0
Chain	\$292.85 167	\$426.46 22

<sup>†</sup> The top number in each cell is the average total observed cost; the bottom number is the number of assessments in that cell.

**Table 2. Total Observed Cost, Casemix Variables, and Facility Characteristics: Results from Switching Regressions**

OS-based variable or facility characteristic

Hospital-based

Freestanding

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No locomotion on unit and bedfast g1e & g6a †	43.03* (23.76)‡	45.31 (35.75)
No Locomotion on unit, bedfast, and ineffective breathing g1e & g6a & NSI 20	32.24 (65.37)	124.8 (158.4)
Weight gain or loss j1a	1.20 (23.11)	20.47‡ (10.07)
Weight gain or loss and IV medications j1a & p1ac	88.06 (75.43)	175.6 (114.8)
Conditions: pain site-- incisions or soft tissue j3f or j3h	46.63** (17.55)	24.80‡ (11.12)
Nutrition: Average fluid intake by IV k6b	14.95** (4.74)	6.97* (3.30)
Skin: Any stage 2, 3, or 4 ulcers m1b or m1c or m1d	20.51 (17.01)	19.06 (11.88)
Skin: Dressings m5g	12.31 (15.18)	26.87 (14.16)
Ineffective breathing pattern NSI 20	64.12** (22.52)	34.81‡ (11.02)
Medications: injections, number of days o3	7.61** (2.41)	4.67* (1.38)
Special: IV medication p1ac	40.91** (16.48)	94.63‡ (27.87)
Special: speech therapy, number of days p1baa	2.30 (3.82)	6.34* (2.46)
Special: occupational therapy, number of days p1bba	-0.97 (2.50)	10.57‡ (2.15)
Special: physical therapy, number of days p1bca	0.75 (2.61)	0.22 (1.97)
Special: respiratory therapy, number of days p1bda	8.08* (4.28)	23.13‡ (3.16)

chain (affiliated with chain)	20.48*	-12.14
	(12.48)	(8.90)
profit (for-profit)	107.32**	16.79*
	(44.12)	(9.58)
beds (number of beds)	-0.09	-0.09**
	(0.08)	(0.03)
ln(Dhosp)	0.10	-18.68
	(10.60)	(12.82)
constant	196.40**	136.64**
	(15.83)	(11.28)
number of observations	350	954
adjusted R-squared	0.38	0.40

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MDS 2.0 item numbers are listed below verbal descriptions.

Standard errors in parentheses.

Statistical significance at 5% denoted by \*\*, 10% denoted by \*.

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**Table 2. Total Observed Cost, Casemix Variables, and Facility Characteristics:  
Results from Switching Regressions**

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Special: occupational therapy, number of days p1bba	-0.97 (2.50)	10.57 (2.15)
Special: physical therapy, number of days p1bca	0.75 (2.61)	0.22 (1.97)
Special: respiratory therapy, number of days p1bda	8.08* (4.28)	23.13 (3.16)

chain (affiliated with chain)	20.48* (12.48)	-12.14 (8.90)
profit (for-profit)	107.32** (44.12)	16.79* (9.58)
beds (number of beds)	-0.09 (0.08)	-0.09** (0.03)
ln(Dhosp)	0.10 (10.60)	-18.68 (12.82)
constant	196.40** (15.83)	136.64** (11.28)
number of observations	350	954
adjusted R-squared	0.38	0.40

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MDS variable codes are listed below verbal descriptions.

Standard errors in parentheses.

Statistical significance at 5% denoted by \*\*, 10% denoted by \*.

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**Table 3. Selection of Treatment in a Hospital-Based Skilled Nursing Facility: Probit Coefficients, Standard Errors, and Marginal Probability Effects**

Variable Description (MDS code)	Coefficient	Standard Error	Marginal Probability Effect <sup>†</sup>
Conditions: Pain site-soft tissue (j3h)	0.691**	0.231	0.085
Diagnoses: Dementia (not Alzheimers) (i1u)	-0.414**	0.212	-0.051
Phys Func: Locom off unit does not occur (g1f)	1.032**	0.284	0.127
Phys Func: Dressing does not occur (g1g)	1.270**	0.428	0.157
Special: Nrs Rehab, Transfer,days (p3e)	-1.982**	0.682	-0.245
Bed mobility, level of assistance (g1ab)	0.548**	0.172	0.068
Medications: Injections, # days (o3)	0.044*	0.024	0.005
Locomotion on unit, level of assistance (g1eb)	0.491**	0.172	0.061
Skin: Preventive foot care (m6e)	-1.074**	0.212	-0.133
Skin: Nails/callouses trimmed (m6d)	-0.753**	0.191	-0.093
Special: Occup Ther, any days (p1bba)	-1.023**	0.287	-0.126
Personal hygiene, level of assistance (g1jb)	-0.611**	0.185	-0.075
Dependent in bathing (g2b)	-0.384	0.247	-0.047
Special: Nrs Rehab, Eating, days (p3h)	0.317**	0.122	0.039
Special: Physician orders, any (p8)	-0.469**	0.196	-0.058
Special: Nrs Rehab, Bed mobility (p3d)	-0.201*	0.111	-0.025
Oral/Nut: Plate guard (k5g)	-1.980*	1.068	-0.244
Locomotion off unit, self-perf level (g1fa)	-0.945**	0.436	-0.117
Locomotion off unit, level of assistance (g1fb)	1.100**	0.432	0.136
Dressing, self performance level (g1ga)	-0.880**	0.345	-0.109
Dressing, level of assistance (g1gb)	1.038**	0.380	0.128
Eating, self-performance level (g1ha)	-0.374**	0.153	-0.046
Bathing, self-performance level (g2a)	0.816**	0.356	0.101
Special: Nrs Rehab, Bed mobility (p3d_any)	1.203*	0.674	0.148
Phys Func: Wheeled self (g5b)	-0.320**	0.159	-0.039
Phys Func: Other person wheeled (g5c)	0.305**	0.156	0.038
Medications: Antianxiety drug, (o4b)	-0.068*	0.039	-0.008
Phys Func: No mode of locomotion (g5e)	0.658**	0.241	0.081
Phys Func: Bedfast (g6a)	-0.435**	0.216	-0.054
Phys Func: Transfer aid (g6e)	0.711**	0.146	0.088
Conditions: Pain frequency (j2a)	0.362**	0.140	0.045
Special: Radiation (p1ah)	1.077*	0.626	0.133
Skin: Pressure-relieving device (m5b)	-0.403**	0.140	-0.05
Special: Occup Ther, days, # (p1bba)	0.238**	0.069	0.029
Special: Monitoring acute condition (p1ae)	-0.859**	0.189	-0.106
Adv. directives: Feeding restriction (a10f)	-1.119**	0.460	-0.138
Special: Nrs Rehab, Eating,days (p3h)	-1.616**	0.745	-0.199
Special: IV medication (p1ac)	0.916**	0.186	0.113
Special: Occup Ther, min, # (p1bbb)	-0.004**	0.001	0
Special: Nrs Rehab, Dressing,days (p3g)	1.678**	0.447	0.207
Special: Intake/output (p1ad)	0.268*	0.141	0.033
Special: Physician orders, # (p8)	-0.046**	0.022	-0.006
Cognitive Patt: Recalls he/she (b3d)	-0.555**	0.152	-0.068
Oral/Nut: Weight change program (k5h)	-0.426*	0.267	-0.053
Diagnoses: Antibiotic-resistant (i2a)	1.016**	0.405	0.125
Diagnoses: Paraplegia (i1x)	1.876**	0.908	0.232

Special: Transfusion (p1ak)	1.163*	0.625	0.143
Oral/Nut: No nutritional approaches (k5i)	0.497**	0.164	0.061
Special: Nrs Rehab, Transfer, days (p3e)	0.378**	0.110	0.047
Skin: Other preventive skin care (m5i)	-0.365**	0.143	-0.045
Special: Suctioning (p1ai)	1.200**	0.293	0.148
Special: Physician visits, # (p7)	0.221**	0.024	0.027
Conditions: No stability problem (j5d)	-0.594**	0.140	-0.073
Continence: Pads or briefs (h3g)	-0.260*	0.153	-0.032
Skin: Pressure-relieving device (m5a)	-0.807**	0.164	-0.1
Special: Nrs Rehab, Walking, days (p3f)	0.083**	0.032	0.01
Skin: Ulcer care (m5e)	0.341**	0.154	0.042
Special: Nrs Rehab, Dressing, days (p3g)	-0.256**	0.074	-0.032
Diagnoses: Emphysema/COPD (ilii)	-0.400**	0.182	-0.049
Constant	-0.839**	0.426	
Number of observations	1304		
Pseudo R-squared	0.62		

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Marginal probability effects are calculated by calculating  $\phi(Z\gamma)$  for each observation (where  $\phi$  denotes the standard normal density function), taking the mean across all observations, and forming the product of that mean and the appropriate coefficient.

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**Table 4. Decomposition of HBSNF Differential**

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MDS Item or Variable Name	HBSNF Coefficient	HBSNF means	Freq Co
g1en_g6a	43.03	0.15	
g1en6a20	32.24	0.03	1
j1a	1.20	0.09	
j1a_p1ac	88.06	0.03	1
j3f_j3h	46.63	0.18	
k6b	14.95	0.73	
m1bcdany	20.51	0.25	
m5g	12.31	0.24	
nsig20	64.12	0.17	
o3	7.61	2.10	
p1ac	40.91	0.34	
p1baa	2.30	0.39	
p1bba	-0.97	1.90	
p1bca	0.75	3.57	
p1bda	8.08	0.72	
Dchain	20.48	0.54	-
Dprofit	107.33	0.06	
Beds	-0.09	65.49	
E(n Dhosp)	0.10	0.45	-
Constant	196.40	1.00	1
<b>Sum</b>			