

## Unstable Demand and Cost per Case in Low-Volume Hospitals

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This Findings Brief looks at the effects of year-to-year changes in annual inpatient discharges on costs per Medicare discharge. Low-volume hospitals, regardless of location, experience significantly greater total variability in inpatient demand across years, and greater changes in annual discharges that cannot be forecasted as part of an individual hospital's trend over time (see NC RHR & PAC Findings Brief, "Unpredictable Demand and Low-Volume Hospitals"). The current analysis finds that small hospital costs are also more sensitive to volume changes. As a result, average costs per discharge are less stable, making it particularly difficult for these facilities to predict and manage profitability under fixed payment schemes.

Specifically, we find that:

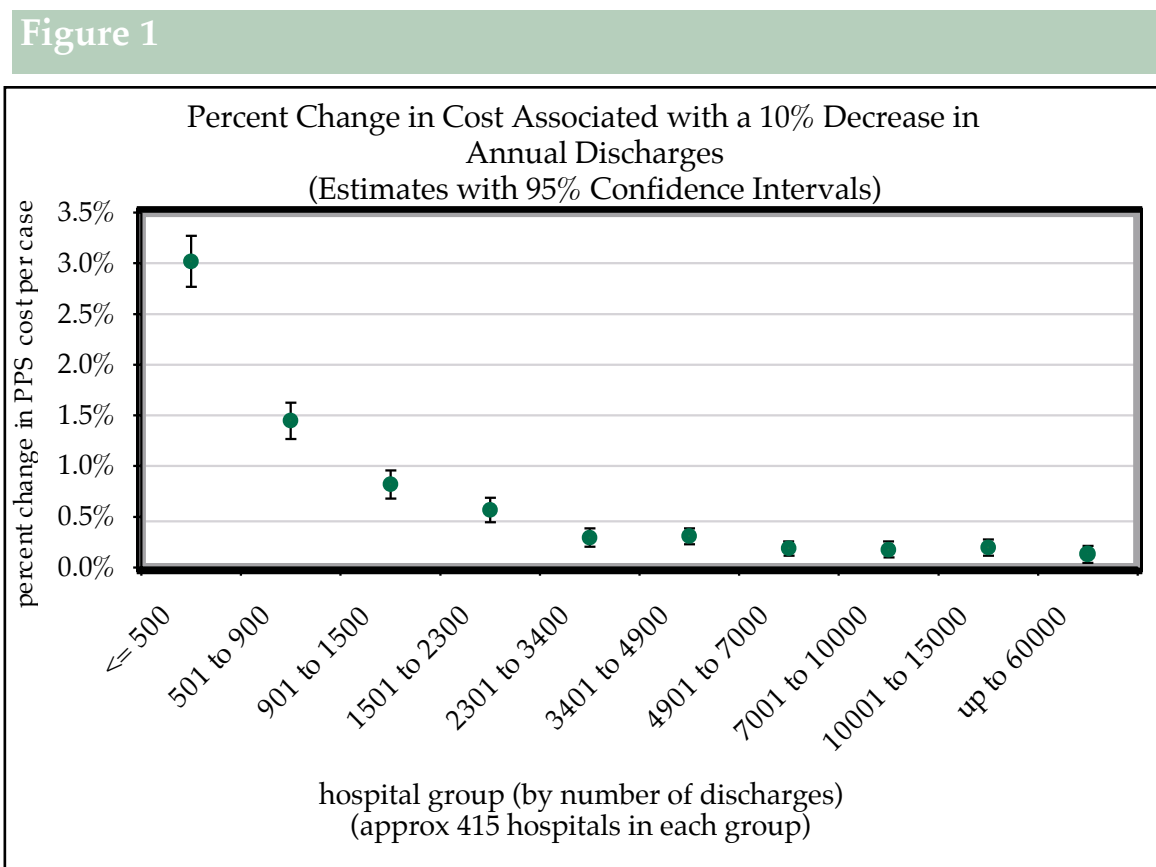
- Among the lowest volume hospitals (with 500 or fewer discharges per year), a 10% decrease in discharges from one year to the next is associated with a 3% increase in the cost per Medicare case. Conversely, a similar percent increase in volume is associated with a decrease in average costs.
- Although low volume, rather than rurality, is the important factor, hospitals in very rural counties tend to be more sensitive to volume changes, primarily because they tend to be smaller.
- Among hospitals with more than 1,500 discharges per year, a 10% decrease in inpatient volume results in only a two to three tenths of a percent increase in cost per case.
- Hospitals that are allowed to use empty acute-care beds for long-term care patients ("swing bed hospitals") are not less sensitive to volume fluctuations.

## Estimating the Volume/Cost Relationship Within Individual Hospitals

We used Medicare cost reports to compute the average inflation-adjusted cost per Medicare discharge for all hospitals paid under Medicare PPS from FY 1990 to 1998. We ranked hospitals by the inpatient volume in their latest year of data and placed them into ten groups of similar size (about 415 in each group). A model was created to estimate the proportional change in cost per case that was associated with a 10% change in volume within an individual hospital (See [Technical Note on the back page](#)). The model also took into account changes in the hospital's case mix and real hourly wages, and controlled for national trends that occurred over this nine-year period such as declining lengths of stay.

### Results

There are striking differences in how year-to-year volume changes can affect unit costs — and therefore profitability — according to the size of the hospital (Figure 1). A 10% volume reduction in hospitals with 500 or fewer total acute discharges per year (88% of which are located in non-metropolitan areas) is associated with a 3% increase in the cost per Medicare discharge. This effect is twice the size of the effect in hospitals with between 501 and 900 total discharges, and



nearly four times the effect found in hospitals with between 901 and 1,500 discharges. A 10% increase in volume would be estimated to have the opposite effect — that is, costs per discharge will decrease.

Over the nine years that we studied, 38% of the hospitals experienced a 10% or greater year to year reduction in discharges at least once, and 36% experienced increases. Smaller facilities, however, were more likely to have reductions than expansions in volume. Comparing change in

annual discharges for the time period between 1997 and 1998, 37% of hospitals in the lowest volume group had a decrease of 10% or more compared to only 5% of hospitals in the group with the highest volume (Table 1).

**Table 1**

<b>Percent of Hospitals with at Least 10% Volume Change Between Federal Fiscal Years 1997 and 1998</b>			
<b>Annual Discharges</b>	<b>Average acute-care bed capacity</b>	<b>Percent of hospitals where the change over the prior year was:</b>	
		<b>≥10% decrease</b>	<b>≥10% increase</b>
< = 500	27	37%	19%
501 - 900	39	27%	22%
901 - 1,500	51	23%	17%
1,501 - 2,300	66	17%	16%
2,301 - 3,400	95	18%	17%
3,401 - 4,900	125	12%	16%
4,901 - 7,000	158	13%	14%
7,001 - 10,000	207	12%	17%
10,001 - 15,000	288	8%	16%
15,001 - 60,000	486	5%	17%
<b>All hospitals</b>	<b>159</b>	<b>17%</b>	<b>17%</b>

Greater sensitivity to volume changes is a reflection of higher fixed costs relative to total costs. This could be related to lack of management flexibility in very small facilities (see discussion in NC RHR & PAC Findings Brief “Unpredictable Demand and Low-Volume Hospitals”), to the need for a minimum investment in plant and equipment regardless of the size of the community served, or to higher levels of unused capacity. The pattern shown in Figure 1 is apparent for all smaller hospitals, whether rural or urban. However, since most of the nation’s smaller hospitals are located in the more rural counties, this greater sensitivity to volume changes is largely a rural hospital issue. The pattern is also present when we separate hospitals by region of the U.S., by type of ownership (for-profit, private non-profit or public), and even when we control for whether or not the hospital also operates swing beds or other long-term care units.

**Policy Implications**

Instability in inpatient demand, coupled with greater sensitivity of unit costs, combine to make it particularly difficult for the low-volume hospitals to function under a fixed payment scheme such as PPS. It is therefore not surprising that between 1998 and 2002, 66% of hospitals with 500 or fewer annual discharges chose to become Critical Access Hospitals and return to retrospective cost-based reimbursement from Medicare (and also Medicaid in some states). Payment floors, blended rates, or other strategies for risk reduction may need to be incorporated into hospital PPS rates, in order for the Medicare program to retain small rural facilities under its prospective payment systems in the future.

## Technical Note:

We analyzed cost reports from 4,968 hospitals, with an average of 8.3 years of data each. The average effect of a 10% change in discharges was estimated using a method called a "fixed effects model" that regressed real hospital cost per case on the annualized number of discharges, controlling for the individual hospital as well as case-mix index, real hourly wages, the number of available beds, and time trend variables identifying each of the separate years from 1990 to 1998.

## Data Sources

Medicare Hospital Cost Report Information System (HCRIS), FY 1990 - FY 1998,  
Area Resource File 2000.

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