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understanding why hospital costs are increasing it depends on the metrics

Obtaining an accurate perspective on the meaning and relative impacts of cost and payment increases in the healthcare industry depends on the specific metrics that provide the basis for the analysis.

To no one's surprise, health care was a primary political issue in the Fall midterm elections. Everyone knows that our country spends more on health care as a percentage of GDP than other developed countries. The primary question that the industry has long grappled with is whether we, as a nation, spend more on health care because we consume much more than anyone else or just spend more for the services that we consume.

A paper published recently in *JAMA* has been cited widely in publications and news broadcasts that have sought to explain the causes for high health-care costs.^a The study is unusual in placing most of the blame on high prices—not on higher utilization. Specifically, the authors show that actual utilization rates—mostly hospital discharge rates for selected procedures—are not materially different from those in 10 other developed countries. Working from this premise, the purpose here is to analyze actual U.S. hospital payments during the period 2011 to 2016, with the goal of defining causes for increases in hospital costs payments. Although hospitals constitute only one segment of healthcare payments, they often have been singled out because of their sheer size and the fact that they account for about 33 percent of total national healthcare expenditures.

Hospital Payment Changes

The first consideration to be addressed is whether hospital payments are increasing at excessive rates. The exhibit on page 2, showing data on national healthcare expenditures made available by the Centers for Medicare & Medicaid Services (CMS), suggests hospital expenditures (defined as actual payments) are expanding more rapidly than costs payments in other healthcare sectors. Hospital expenditures, including those of VA hospitals

AT A GLANCE

- > An analysis sought to understand the underlying significance of rising expenditures within the nation's hospital sector over the period of 2011 to 2016.
- > Significantly, when increases were measured per Equivalent Discharge™ (a volume metric deemed to provide the most accurate picture of the nature of increases in cost and payment), the analysis found that actual hospital payment increased only 3 percent during the five-year period while hospital operating costs increased 6.5 percent, pointing to an erosion in profitability from patient service delivery.
- > A key takeaway of the study was that findings of such analyses will vary depending on the metric used to assess changes, making it important to consider factors that might compromise the reliability of the metrics used for analysis.

a. Papanicolas, I., Woskie, L.R., Jha, A.K., "Health Care Spending in the United States and Other High-Income Countries," *JAMA*, March 13, 2018.

and other military hospitals, increased 27.1 percent to \$1.082 trillion dollars in 2016 from \$851.9 billion in 2011. This rate of increase exceeded the increase in all national healthcare expenditures (24.1 percent) during the same time period.

Our nation's population increased 3.8 percent during the five-year period, indicating that most of the hospital increase is due either to increased utilization per person or to increased payments for those services, or to some combination of both. To analyze actual hospital payment, we introduce this simple formula:

$$\text{Hospital Payment} = \text{Population} \times (\text{Volume of Hospital Encounters} \div \text{Population}) \times \text{Prices Paid for Hospital Encounters}$$

Hospital payments are a function of three factors: increases in the patient population, changes in service intensity per person, and prices paid for hospital services. Simplifying the expression would state that hospital payments are the result of the number of hospital encounters provided times the actual prices or payments for each of those services.

Data and Methodology

To analyze actual hospital cost payment, three data sets were used: Medicare Cost Reports, Medicare Provider Analysis and Review (MedPAR) files, and Hospital Outpatient Prospective Payment System (OPPS) data for 2011 and 2016. The analysis was limited to hospitals that are paid under the PPS. From the Medicare Cost Reports, the actual net patient revenue realized from all payers was captured for every PPS hospital in 2011 and 2016. The exhibit at right shows CMS national healthcare expenditures data for 3,258 PPS hospitals in 2011 and 3,282 PPS hospitals in 2016, representing 80 percent of all hospital expenditures. It therefore is reasonable to conclude these data provide an accurate basis for assessing drivers of hospital costs.

The Likely Cause for Payment Increases

A critical dimension to any analysis of hospital costs payment is the definition of *volume of service*.

The *JAMA* study mostly referenced specific inpatient procedures such as knee and hip replacements and heart surgeries. These procedures account for a small portion of all inpatient procedures and do not really reflect the fast-growing hospital outpatient sector.

The exhibit on page 3 shows three alternative hospital metrics that have been used to measure total hospital volume:

- > Adjusted patient days
- > Adjusted discharges
- > Equivalent Discharges™

Equivalent Discharges is a metric that defines a single measure of total hospital volume in both inpatient and outpatient sectors. In that regard, it is similar to adjusted patient days and adjusted discharges, but it removes a significant source of bias that results from variations in both inpatient and outpatient case mix complexity. Case mix complexity is not recognized in adjusted patient days and adjusted discharges.

Previously published research has shown that the Equivalent Discharges metric is more closely correlated with hospital costs than are either adjusted patient days or adjusted discharges.^b Because the focus here is on payment from the consumer's perspective, the appropriate definition of *payment* becomes hospital net patient revenue (NPR).

b. For a discussion of how Equivalent Discharges™ exhibit a greater correlation with hospital costs than do either adjusted patient days or adjusted discharges, see Cleverley, W., "Time to Replace Adjusted Discharges," *hfm*, May 2014.

NATIONAL HEALTH EXPENDITURES, 2011 TO 2016

| Category | 2011 | 2016 | Percentage Change, 2011-16 |
|---|-------------|-------------|----------------------------|
| Total National Health Expenditures (Millions) | \$2,689,349 | \$3,337,247 | 24.1% |
| Total Hospital Expenditures (Millions) | \$851,850 | \$1,082,479 | 27.1% |
| Population (Millions) | 311.64 | 323.41 | 3.8% |

ACTUAL NET PATIENT REVENUE REALIZED (NPR) FROM ALL PAYERS FOR EVERY HOSPITAL UNDER THE PROSPECTIVE PAYMENT SYSTEM (PPS), 2011 AND 2016.

| Category | 2011 | 2016 | Change in Number, 2011 to 2016 | Percentage Change, 2011 to 2016 |
|---|-------------|-------------|--------------------------------|---------------------------------|
| PPS Acute Care Net Payment Revenue (Millions) | \$678,648 | \$831,149 | \$152,501 | 22.5% |
| Number of Hospitals | 3,258 | 3,282 | 24 | 0.7% |
| PPS Acute Care Revenue to Total Hospital Expenditures | 79.7% | 76.8% | | |
| Volume Metrics | | | | |
| Adjusted Patient Days | 276,686,019 | 303,632,124 | 26,946,105 | 9.7% |
| Adjusted Discharges | 60,930,972 | 65,804,382 | 4,873,410 | 8.0% |
| Equivalent Discharges™ | 76,281,938 | 90,742,453 | 14,460,516 | 19.0% |
| Price per Unit | | | | |
| NPR per Adjusted Patient Days | \$2,453 | \$2,737 | \$285 | 11.6% |
| NPR per Adjusted Discharge | \$11,138 | \$12,631 | \$1,493 | 13.4% |
| NPR per Equivalent Discharge™ | \$8,897 | \$9,159 | \$263 | 3.0% |
| Intensity of Service | | | | |
| Adjusted Patient Days per 1,000 Population | 887.84 | 938.85 | 51.01 | 5.7% |
| Adjusted Discharges per 1,000 Population | 195.52 | 203.47 | 7.95 | 4.1% |
| Equivalent Discharges™ per 1,000 Population | 244.78 | 280.58 | 35.80 | 14.6% |

Using the PPS data set, we computed the correlation of each of the three volume metrics with reported net patient revenue. The adjusted R^2 , which measures how close the actual observations are to the fitted regression, was significantly higher when Equivalent Discharges were used (90 percent), compared with adjusted discharges (72 percent) and adjusted patient days (80 percent).

Equivalent Discharges has a greater ability than either of the other metrics to explain changes in NPR between periods. When regressions relating the change in NPR from 2011 to 2016 were run against the change in volume using the three volume metrics, Equivalent Discharges explained 69 percent of the change in NPR while adjusted patient days and adjusted discharges explained only 32 percent and 16 percent, respectively.

Values for the alternative volume metrics show significant differences in growth between 2011 and 2016. The Equivalent Discharges metric has a much larger percentage increase over the time period (19.0 percent) compared with 9.7 percent for adjusted patient days and 8.0 percent for adjusted discharges. If the metric provides a better assessment of actual hospital volume than does either of the other metrics, one also can expect that using Equivalent Discharges to assess of the causes for hospital cost payment increases will produce findings very different from those derived from using either of the other two metrics.

The Equivalent Discharges metric shows that intensity of service as measured by adjusted Equivalent Discharges per 1,000 population increased 14.6 percent, whereas the increases

identified using the adjusted patient days and adjusted discharges metrics were 5.7 percent and 4.1 percent, respectively. Because volume as measured by Equivalent Discharges increased more rapidly than was indicated using the other metrics, the Equivalent Discharges metric also points to considerably more modest increase in price or payment, at 3.0 percent over the 5-year period. The adjusted patient days and adjusted discharges metrics showed double-digit price increases of 11.6 percent and 13.4 percent, respectively. The premise that the Equivalent Discharges metric percentage provides a more accurate view of how much of increased hospital expenditures can be explained by increases in prices is supported by data from the Bureau of Labor Statistics in the Hospital Services component of the Consumer Price Index (CPI). The values shown in exhibit above right indicate small annual rates of change in CPI for hospital services and support the split between price and volume reported using the Equivalent Discharges metric.

The exhibit below right uses variance analysis to isolate the causes for the increase in total hospital payment from 2011 to 2016 (\$152.5 million). The Equivalent Discharges volume metric suggests only 16 percent was caused by actual increases in payment per unit while 84 percent is related to increased population and intensity of service. The vast majority is related to increased intensity because population only increased 3.8 percent.

This conclusion may not contradict the views expressed by the *JAMA* article’s authors because actual volumes of the specific services reviewed across the 10 developed countries in 2016 may not have differed from the U.S. volumes. Nonetheless, although volumes may not differ across developed countries at present for those specific services identified, our temporal analysis of U.S. hospital payment suggests that increases in volume—not increases in prices—are the primary cause for hospital payment increases in the past five years. This is an important point because it belies the *JAMA* authors’ suggestion that controlling utilization is not nearly as important as controlling actual payment per unit of service.

CHANGES IN CONSUMER PRICE INDEX (CPI) COMPONENTS

| Year | CPI | Hospital Services | Medical Care |
|------|------|-------------------|--------------|
| 2012 | 1.8% | 1.6% | 3.2% |
| 2013 | 1.4% | 0.0% | 2.0% |
| 2014 | 1.5% | 1.2% | 3.0% |
| 2015 | 0.3% | 2.0% | 2.6% |
| 2016 | 1.5% | 0.5% | 4.1% |

Reliability of Equivalent Discharges

The conclusion based on the use of the Equivalent Discharges hospital volume metric that most of the increase in hospital expenditures can be attributed to increased volume, and not so much to increases in prices paid for hospital services, is in sharp contrast to the conclusions based on the use of the adjusted patient days and adjusted discharges hospital volume metrics, which pin the majority of the increase in hospital payment to increases in prices paid. The reason for this variance is simply that the Equivalent Discharges metric show a much larger volume increase over the five-year period compared with other two alternatives. That said, evidence from previous research strongly suggest the Equivalent Discharges metric is a much better predictive tool for explaining changes in net patient revenue.

The Equivalent Discharges metric has been shown to have better statistical explanatory power than either adjusted patient days or adjusted discharges, and there are logical reasons the metric has been increasing more rapidly than either of the other metrics. To illustrate this point, the exhibit on page 5 provides a perspective on the changing nature of hospital

VARIANCE ANALYSIS OF HOSPITAL COST INCREASES 2011 TO 2016

| Volume Metrics | Volume (Includes Population Effect) | Price Variance | Total |
|------------------------|-------------------------------------|----------------|-------|
| Adjusted Patient Days | 43% | 57% | 100% |
| Adjusted Discharges | 36% | 64% | 100% |
| Equivalent Discharges™ | 84% | 16% | 100% |

CHANGES IN ENCOUNTER INTENSITY

| Variable | 2011 | 2016 | Percentage change, 2011 to 2016 |
|--|------|-------|---------------------------------|
| Weighted Average Case Mix Index per Inpatient Claim | 1.65 | 1.80 | 9.1% |
| Weighted Average Ambulatory Payment Classification Weight per Outpatient Claim | 9.89 | 10.89 | 10.1% |
| Weighted Average Inpatient Charges to Total Charges Percentage | 57.9 | 52.4 | -9.5% |

encounters during the 2011 to 2016 period. First, it clearly shows the hospital industry is shifting increasingly to an outpatient focus. In 2016, the actual percentage of total inpatient gross charges was 52.4 percent, compared with 57.9 percent in 2011. Note that the numbers displayed are weighted by hospital size. Smaller hospitals have even higher percentages of outpatient revenue.

The case mix complexity of both inpatient and outpatient encounters also is increasing. In the inpatient arena, the actual average case mix index increased 9.1 percent over the period of 2011 to 2016. The increase in case complexity in the outpatient arena is even larger, at 10.1 percent.

It is this increase in the complexity of hospital encounters that explains the variance in volume changes between Equivalent Discharges and adjusted patient days and adjusted discharges. As shown in the exhibit on page 3, Equivalent Discharges volume increased at a rate of about 9 to 11 percentage points more than did adjusted patient days or adjusted discharges over the study time period. This rate of increase matches the rate at which case complexity increased. Further, the larger increase in outpatient care is associated with the larger increase in case complexity.

Using an inpatient measure of volume—either adjusted patient days or adjusted discharges—will be biased downward as case complexity increases. For example, a shift to more complex inpatient surgical procedures from lower weighted inpatient medical procedures might not change

either adjusted patient days or adjusted discharges, but it would increase Equivalent Discharges. Because case mix complexity in both hospital inpatient and outpatient services is increasing, use of either the adjusted patient days or the adjusted discharges volume metric will understate actual changes in hospital volume changes.

Impact on Hospital Profitability

The fundamental consideration is the actual impact of these changes on hospital profitability. The exhibit on page 6 presents some key data elements that summarize patient profitability for the roughly 3,000 acute care PPS hospitals included in the study. Not unexpectedly, the data show that actual patient payment as measured by net patient revenue increased 22.5 percent during the period, while total expenses derived from Worksheet A/Column 7 in the Medicare Cost Report increased 26.7 percent. Combined, these trends resulted an 11 percent overall reduction in net income from patients. Using the Equivalent Discharges metric for volume, these numbers were converted to per unit values. On this basis, patient revenues increased 3 percent while expenses increased 6.5 percent. The net effect was a 25.2 percent reduction in per unit profit.

The purpose here is not to suggest the idea that hospital profitability is being compromised is a new revelation. Rather, it is simply to show that it is incorrect to conclude that increased payments in the hospital sector are the result of increasing payment per unit of service. The primary driver of increasing hospital expenditures has been increased intensity of service. Without increased payment for hospital services, especially from governmental payers, reductions in hospital cost will become crucial to hospital financial viability.

Although hospitals have successfully controlled per unit cost increases, limiting them to slightly more than 1 percent per year over the five-year period, actual payments have not kept pace. It should be noted that the income from patient services reported here is larger than final net income from all sources for the industry. For the entire industry, because of expenses and revenues

not related to patients, actual net income in 2016 was about \$21 billion lower than shown here, and it was \$19 billion lower in 2011.

To assess the ability of the industry to curtail expenses in the future, we aggregated actual hospital expenses by cost center from Medicare Cost Reports for the years 2011 and 2016. The exhibit on page 7 presents these data on a per Equivalent Discharges basis. General service costs, which represent 44 percent of total expenses, represent the largest expense category. Within the general services group, the rate of increase for the administrative and general expense category was quite large, at 18.1 percent. Increases in administrative costs have been cited as being especially large in the United States, which some have attributed to the complexity of payment systems.^c It was surprising, however, to see actual increases in the administrative and general group because these costs tend to be seen as fixed in nature and not related to volume changes (although these cost can increase with significant volume changes). Increasing volumes should, therefore, force the expense per unit downward, which was not observed in the data.

Inpatient nursing costs actually declined by \$8.45 on a per unit basis. Ancillary costs showed an increase of \$144.61 on a per unit basis. If drugs

and supplies were excluded from total ancillary costs, there would have been a decrease of \$15.58 per Equivalent Discharges. The reason for the overall increase in the ancillary cost area is directly related to increases in supplies and especially drugs. The increase in the costs of drugs charged to patients was \$119.24 per Equivalent Discharges, representing a 36.6 percent increase. Also contributing to the total increase was a 19.5 percent increase in outpatient costs—mostly in the clinical and emergency department areas. Much of the increase in the nonreimbursable area was related to physician’s private offices.

A True Picture of the Industry’s Trajectory

Actual hospital payments increased 27 percent from 2011 to 2016, which exceeded the rate of increase in total national health expenditures (24 percent). Many have attributed the increase in hospital payments to larger prices or payments for hospital-specific services, such as joint surgeries, and not to increased volume of services. This analysis refutes this conclusion, finding that 84 percent of the increase in actual hospital payments was related to increases in volume related mostly to a rising complexity of hospital encounters, leaving only 16 percent to be tied to actual increased payment per encounter. Case mix acuity increased 9.1 percent for inpatient encounters and 10.1 percent for hospital outpatient encounters. Such shifts in encounter complexity are not apparent when

c. Himmelstein, D.U., Jun, M., Busse, R., et al., “A Comparison of Hospital Administrative Costs in Eight Nations: U.S. Costs Exceed All Others by Far,” *Health Affairs*, September 2014.

| HOSPITAL INCOME ASSESSMENT, 2011 TO 2016 | | | |
|---|-------------------|-------------------|----------------------------|
| Variable | 2011 | 2016 | Percentage Change, 2011-16 |
| Net Inpatient Revenue | \$678,647,641,366 | \$831,149,236,574 | 22.5% |
| Total Expense (Worksheet A/Column 7) | \$601,759,020,909 | \$762,692,136,549 | 26.7% |
| Net Income from Service to Patients | \$76,888,620,457 | \$68,457,100,024 | -11.0% |
| Net Patient Revenue per Equivalent Discharge™ | \$8,897 | \$9,159 | 3.0% |
| Total Expenses per Equivalent Discharge™ | \$7,889 | \$8,405 | 6.5% |
| Net Income from Service to Patients per Equivalent Discharge™ | \$1,008 | \$754 | -25.2% |

| EXPENSES PER EQUIVALENT DISCHARGE™ | | | | |
|---|-------------------|-------------------|------------------------------------|---------------------------------|
| Cost Center Area | 2011 | 2016 | Dollar Amount Change, 2011 to 2016 | Percentage Change, 2011 to 2016 |
| General Service | | | | |
| Capital-Related Costs | \$547.87 | \$558.48 | \$10.61 | 1.9% |
| Employee Benefits Department | \$670.78 | \$648.16 | -\$22.62 | -3.4% |
| Administrative and General | \$1,156.86 | \$1,366.47 | \$209.61 | 18.1% |
| Nursing Administration | \$87.15 | \$97.79 | \$10.64 | 12.2% |
| Other General Service | \$861.95 | \$863.43 | \$1.49 | 0.2% |
| Education Costs | \$162.20 | \$169.05 | \$6.85 | 4.2% |
| Total General Services | \$3,486.80 | \$3,703.38 | \$216.58 | 6.2% |
| Inpatient Nursing | \$1,066.07 | \$1,057.62 | -\$8.45 | -0.8% |
| Ancillary Services | | | | |
| Drugs Charged to Patients | \$325.42 | \$444.66 | \$119.24 | 36.6% |
| Medical Supplies Charged to Patients | \$265.77 | \$278.31 | \$12.54 | 4.7% |
| Implantable devices Charged to Patients | \$337.15 | \$365.65 | \$28.50 | 8.5% |
| All Other | \$1,431.38 | \$1,415.70 | -\$15.68 | -1.1% |
| Total Ancillary | \$2,359.72 | \$2,504.32 | \$144.61 | 6.1% |
| Outpatient | \$417.23 | \$498.43 | \$81.19 | 19.5% |
| Other Reimbursable | \$155.48 | \$154.71 | -\$0.76 | -0.5% |
| Total Reimbursable | \$7,486.46 | \$7,915.69 | \$429.22 | 5.7% |
| Non-Reimbursable | \$400.99 | \$489.71 | \$88.72 | 22.1% |
| Total Expenses | \$7,888.62 | \$8,405.02 | \$516.40 | 6.5% |

analyses use traditional measures of hospital output such as adjusted patient days or adjusted discharges. To accurately identify and assess the nature and impact of rising healthcare costs, an analysis must be based on reliable volume metrics, and the Equivalent Discharge metric has been shown to correctly incorporate all the changes outlined here to provide a true picture of actual volume change.

Significantly, although actual hospital payment per Equivalent Discharges increased only 3 percent from 2011 to 2016, hospital operating costs per Equivalent Discharges increased 6.5 percent, pointing to an erosion in profitability

from patient service delivery. Operating cost increases were especially large in the pharmaceutical and administrative areas. The concern is that, if hospitals experience larger increases in costs in the future without payment relief, their financial viability could be compromised. ■

About the author



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