FEATURE STORY

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REPRINT May 2014

hfm
healthcare financial management association hfma.org

time to replace adjusted discharges

A new metric for measuring total hospital volume correlates significantly better with cost than do adjusted discharges—without the same inherent flaws.

AT A GLANCE

- With inpatient revenue averaging less than 50 percent of total operating revenue for hospitals and bundled payments becoming the norm, Equivalent Discharges™ is a simple, alternative metric that offers superior predictive power of hospital volume.
- Equivalent Discharges are not subject to the same measurement flaws as adjusted discharges or adjusted patient days.
- The new metric also explains cost variation in situations where there is a more complex case mix.

Back in the mid-1970s, the predominant measure of total hospital volume that financial analysts used to benchmark revenue and cost was adjusted patient days. They would analyze changes in revenue or expense per adjusted patient day to assess performance for a given hospital over time and then compare that performance with other hospitals' performance to evaluate relative efficiency. Adjusted patient days made perfect sense at that time because the percentage of outpatient revenue was less than 20 percent of total operating revenue, and many hospitals were being paid on a cost or per-diem basis.

By the mid-1980s, because many payment plans, most notably Medicare, had shifted to per-case payment, most analysts used adjusted discharges as benchmarks in lieu of adjusted patient days. The percentage of outpatient revenue was climbing, but it was still less than 35 percent of operating revenue for most hospitals. With DRG case weights, multiplying the adjusted-discharge value by the hospital's actual case mix index would enhance the adjusted-discharge metric.

That was then.

Fast forward to 2014, when the median percentage of inpatient revenue is less than 50 percent, and many hospitals are experiencing bundled payments not only for inpatients, but also for outpatients. The largest third-party payer, Medicare, pays for inpatient care on a Medicare severity-adjusted DRG (MS-DRG) basis and for outpatient care on an ambulatory patient classification (APC) basis. Although the hospital industry has seen dramatic operating changes, the primary metric for total hospital volume is still an adjusted discharge or an adjusted discharge that has been inpatient case mix adjusted.

Virtually every hospital finance executive knows that relative pricing methodology can influence adjusted discharges or adjusted patient days. Increases in relative outpatient prices will artificially increase adjusted discharges, while decreases in relative outpatient prices will artificially decrease adjusted discharges. In addition, modifying an adjusted discharge value by the inpatient case mix makes little sense because the complexity of an organization's outpatient case mix does not always correlate with that of its inpatient case mix.

Equivalent Discharges™ is an alternative metric for hospital volume that is not subject to the same measurement flaws as adjusted discharges or adjusted patient days.[a] Old ways die hard, but Equivalent Discharges is a far better metric for many reasons, the primary of which is that it correlates more significantly with cost than adjusted discharges.

Adjusted Discharges Compared with Equivalent Discharges

Before presenting empirical evidence regarding the superior predictive power of Equivalent Discharges over adjusted discharges, it is necessary to define each metric. The adjusted discharge metric is expressed in the following formula:

Adjusted Discharges = Inpatient Discharges + [(Gross Outpatient Revenue/Gross Inpatient Revenue) × Inpatient Discharges]

The case mix adjusted discharge metric is determined by multiplying the result of this formula by the inpatient case mix index.

Equivalent Discharges is expressed as follows:

Equivalent Discharges = Case Mix Adjusted Discharges + Conversion Factor × Case Mix Adjusted Visits

The exhibit on page 3 provides a simple illustration of how a hypothetical hospital would compute each metric. It also shows an alternate scenario that reduces outpatient prices by 20 percent to enhance price competitiveness with independent imaging and surgery centers. This scenario highlights a primary flaw in the adjusted discharge methodology.

The elements of the Equivalent Discharge computation in the exhibit require some initial explanation. *Equivalent inpatient discharges* is simply the total of all inpatient cases times their case weight. For example, if a hospital treated two inpatient cases—one with a MS-DRG case weight of 2.0 and another with a case weight of 1.5—the total equivalent inpatient discharges would be 3.5 (2.0 + 1.5). In the table, 600 inpatient discharges with an average case mix index of 2.0 would yield 1,200 equivalent inpatient discharges. This is a direct expression of the level of hospital's inpatient volume based on Medicare's MS-DRG weights.

Similarly, *equivalent outpatient visits* is simply the total APC weight of all visits. For example, if a hospital had two outpatient visits—one with an APC weight of 10 and the other with an APC weight of 8—the total equivalent outpatient visits would be 18. In the table, 31,225 outpatient visits with an average APC weight of 3.0 would yield 93,675 equivalent outpatient visits. This is a direct expression of the hospital's level of outpatient volume based on Medicare's APC weights.

The only area left to define is the *outpatient conversion factor*—the ratio of Medicare outpatient payment to Medicare inpatient payment. If a hospital received $5,000 for a Medicare inpatient case with an MS-DRG case weight of 1.0 and $60 for an outpatient visit with an APC weight of 1.0, then the conversion factor would be 1.2 percent ($60/$5,000). This conversion factor is the key to translating outpatient volume to relative inpatient volume. In the table, multiplying the 1.2 percent conversion factor by the 31,225 equivalent outpatient visits yields 1,124 equivalent outpatient discharges. Adding equivalent inpatient discharges (1,200) and equivalent outpatient discharges (1,124) yields Equivalent Discharges (2,324).

a. Cleverley, W.O., and Cleverley, J.O., "A Better Way to Measure Volume—and Benchmark Costs," *hfm*, March 2011.

Two assumptions are involved in the Equivalent Discharge metric computation. The first is that the Medicare MS-DRG case weights and the Medicare APC case weights do reflect underlying resource cost. The Centers for Medicare & Medicaid services (CMS) has claimed that this is true: Payments are related to resource costs, and weights are changed over time to reflect cost changes.

The second assumption concerns the validity of the conversion factor. The underlying question is whether CMS is attempting to pay for both inpatient and outpatient services in the same way—not to ensure that payments are adequate to cover costs, but to ensure that payments cover the same percentage of costs in both inpatient and outpatient settings. Again, the assumption is that Medicare payments are structured to provide reasonable equity across both inpatient and outpatient settings.

Most hospital executives understand that pricing decisions can affect the measurement of adjusted discharges. Historically, many hospitals have increased outpatient prices at rates greater than inpatient prices to take advantage of a greater percentage of charge-payment arrangements. The net effect of this differential pricing has been an increase in the level of reported adjusted discharges, making it appear that volumes are increasing more than they actual have been. The result is an understated cost per adjusted discharge relative to prior periods or compared with that seen by other hospitals with a different pricing policy.

A recent trend in hospital pricing involves the reduction of outpatient prices to levels more competitive with freestanding imaging and surgery centers. The exhibit below illustrates the impact of a reduction in outpatient pricing upon adjusted

COMPUTATION OF ADJUSTED DISCHARGES AND EQUIVALENT DISCHARGES™

	Current Pricing	Proposed 20 Percent Reduction in Outpatient Prices
Adjusted Discharges		
Gross Inpatient Charges	$10,000,000	$10,000,000
Gross Outpatient Charges	$10,000,000	$8,000,000
Inpatient Discharges	600	600
Inpatient Case Mix Index	2.00000	2.00000
Adjusted Discharges	**1,200**	**1,080**
Adjusted Discharges, Case Mix Modified	**2,400**	**2,160**
Equivalent Discharges		
Inpatient Discharges	600	600
Inpatient Case Mix Index	2.00000	2.00000
Equivalent Inpatient Discharges	1,200	1,200
Outpatient Visits	31,225	31,225
Average APC Visit Weight	3.000	3.000
Equivalent Outpatient Visits	93,675	93,675
Outpatient Conversion Factor	1.20%	1.20%
Equivalent Outpatient Discharges	1,124	1,124
Equivalent Discharges	**2,324**	**2,324**

discharges and equivalent discharges. A 20 percent reduction in outpatient pricing will reduce adjusted discharges by 10 percent, but will have no effect on equivalent discharges, making cost or revenue metrics based upon equivalent discharges more comparable across time and across other hospitals.

Data and Method

Data from 2012 and 2011 Medicare cost reports and Medicare claims files (the Medicare Provider Analysis and Review [MedPAR] file for inpatient claims and the Standard Analytical Outpatient file for outpatient claims) shed light on the question of predictive validity. Our final data set consisted of 2,919 acute care hospitals, excluding critical access hospitals that are paid under Medicare's prospective payment system. The composition of this data set is displayed in the exhibit below.

To assess the relative predictability of the adjusted-discharge methodology compared with Equivalent Discharges, we ran a simple regression with total cost (adjusted for cost of living differences) as the dependent variable and the following alternative volume metrics as independent variables:

> Hospital discharges
> Hospital discharges × Medicare case mix index (HD-CMI)
> Adjusted hospital discharges (AHD)
> Adjusted hospital discharges × Medicare case mix index (AHD-CMI)
> Equivalent Discharges

A constant was included in each regression that is consistent with the basic accounting equation for total cost (Total Cost = Fixed Cost + Variable Cost per Unit × Volume).

The total cost value reported in Worksheet A/Column 7/Line 118 of the Medicare cost report includes all costs after adjustments and reclassifications, including removing cost of living differences by applying the hospital's wage index to 60 percent of its cost. For example, if the total reported cost was $100 and the wage index was 1.2, we defined the cost value as $90 ([0.6 × $100]/1.2 + [0.4 × $100]).

We ran three separate sets of regressions with 2012 total cost as the dependent variable: one for all 2,919 hospitals, one for just nonteaching hospitals, and one for teaching hospitals. We also ran one additional regression that was based on the change in total expense from 2011 to 2012.

Results

The exhibit on page 5 shows the relative R^2 values for the five alternative volume metrics and the four regression equations. The R^2 value of 79.0 for the hospital-discharge metric for all hospitals in the exhibit indicates that the regression-fitted equation explained 79.0 percent of the variance between the actual reported cost value and the mean value for the 2,919 hospitals. We anticipated high R^2 values because volume is the key explanatory variable in this distribution of total costs, which ranged from a low of $3.1 million to a high of $2.9 billion with a mean value of $179.7 million. Major conclusions of the analysis are as follows.

The Equivalent Discharge metric predicted cost better than all of the alternative volume metrics.

The gap was the largest for the teaching hospital regressions where the Equivalent Discharge metric explained 91.4 percent of the cost variation. In all four alternative volume metrics, there was a

DISTRIBUTION OF HOSPITALS INCLUDED IN STUDY

	Government	Voluntary Not-for-Profit	Proprietary	Total
Teaching	113	614	110	837
Nonteaching	352	1,078	652	2,082
Total	465	1,692	762	2,919

sizable reduction in R^2 for the teaching hospital group compared with the nonteaching hospital group. There was no reduction in R^2 for the Equivalent Discharge metric; there actually was a small improvement, which indicates that the Equivalent Discharge metric explains cost variation better in situations where there is a more complex case mix relative to all adjusted discharge metrics.

The improved cost predictability that resulted in the Equivalent Discharge regressions is significant and substantial. This finding may not be immediately apparent given the relatively high R^2 values for all of the models, however. For example, the average absolute error between actual and predicted costs for the 2,919 hospitals was $29.5 million for the Equivalent Discharge regression compared with $41.5 million for the AHD-CMI regression. This result suggests that the predictive accuracy of the Equivalent Discharge metric is 41 percent greater than that of the AHD-CMI metric. The Equivalent Discharge regression also predicted cost values that were closer to actual costs more than 60 percent of the time.

The adjusted discharge methodology does not improve cost predictability when compared with actual inpatient discharges that are not adjusted for outpatient services. For example, the hospital discharge regressions recorded higher R^2 values than the AHD regressions in all three of the total cost models, and the HD-CMI regressions recorded higher R^2 values than the AHD-CMI regressions in two of the three total-cost models. At first, this observation does not appear to make much sense. How could an inpatient-only volume metric have a better relationship with cost than an adjusted-volume metric that incorporates both inpatient and outpatient volume? The reason for this seeming inconsistency can be seen using the example in the exhibit on page 3. Whenever different rates of pricing between inpatient and outpatient services exist, there is a bias in measuring total volume using the ratios of inpatient and outpatient charges. This is true when comparing one hospital with another hospital or when comparing one hospital over time. In a world where hospital pricing often is unrelated to relative case complexity, the use of unadjusted discharges may be just as valid as adjusted discharges.

Although the R^2 values for the change in cost regressions are much lower, the Equivalent Discharges regression explains a much larger percentage of the variance than all other volume alternatives. The lower R^2 values, due to variation in the change of cost variable, are much larger than the variation in the total cost variable. The mean change in cost for the 2,919 hospitals between 2011 and 2012 was $7,454,000, with a standard deviation of $21,276,000 that produces a coefficient of variation (standard deviation divided by mean) of 2.85. The coefficient of variation for the 2012 total cost variable was 1.28, which was less than half of the value for the change in cost variable.

R^2 VALUES FOR COST PREDICTION

Volume Metric	All Hospitals (2,919)	Nonteaching Hospitals (2,082)	Teaching Hospitals (837)	Change in Cost 2011 to 2012 (2,919)
Hospital Discharges	79.0	84.0	72.6	2.4
Hospital Discharges-Case Mix Index	85.1	86.4	80.4	4.2
Adjusted Hospital Discharges	75.8	83.5	66.8	2.5
Adjusted Hospital Discharges-Case Mix Adjusted	82.7	88.2	75.3	3.9
Equivalent Discharges	93.0	90.4	91.4	17.6

A More Viable Metric

It is time for the hospital industry to abandon the use of adjusted discharges or adjusted patient days—a methodology that relies on the flawed assumption that all hospitals are pricing both inpatient and outpatient services on a similar basis. If this assumption were true, it would imply three things:

- All inpatient cases are priced based on complexity, so that, for all hospitals and between time periods for any given hospital, a discharge with a case weight of 2.0 will always be priced twice as high as one with a case weight of 1.0.
- All outpatient cases also are priced based on complexity so that, similarly for all hospitals and between time periods for any given hospital, an outpatient visit with an APC relative weight of 10.0 will be priced twice as high as one with an APC relative weight of 5.0.
- Pricing between inpatient and outpatient services must reflect their relative case complexity, be constant over time, and ultimately reflect relative resource cost that is normative based. Outpatient prices cannot be priced higher or lower on a relative basis than inpatient prices.

For 2,919 acute care hospitals, however, we found that with use of Equivalent Discharges to define total volume, the relationship between total cost and changes in cost was significantly higher than with the use of any adjusted-discharge metric. In fact, because of continuing price bias, not adjusting inpatient discharges provided a better prediction of total cost than an adjustment discharge methodology based upon the ratio of inpatient and outpatient charges.

Some may argue that because the adjusted discharge method is universally understood and easily computed, it should be continued. But this position does not make the method valid, and there is ample evidence to suggest that it is heavily biased. With respect to ease of computation, most, if not all, hospitals can easily compute Equivalent Discharges with the MS-DRG case weights for inpatient volume and the APC case weights for outpatient volume. ●

About the author

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