LTCH Payment Methodology Review and Results

Existing Model

The existing payment structure for case level payments, rather than direct graduate medical education (DGME) disbursements, for Long Term Care Hospitals (LTCH) is given as:

PPS Payment = SBR * (WI * Lab Shr) * Case Wt * COLA+ Outlier Payments

Definitions:

Standard Base Rate (SBR) – updated annually to account for projected inflation using excluded hospital market basket compiled by Global Insight (DRI)

Wage Index (WI) – The geographical variability of wages is calculated as an index. Data upon which this calculation is based is obtained from the acute hospital survey of wages and used as a proxy for LTCH. The resultant index is then applied to that proportion of hospital payment covering costs impacted by geographic differences in the level of labor cost. This portion (Lab Shr) is currently estimated at 75.788% for RY2008. The calculation is determined independently of the payment model by assessing the components of the excluded hospital market basket.

Case Mix Index (CMI) – Average Case Weight for hospital
Case Weight (Case Wt) – relative weights are calculated using the following steps:

i) Cases with zero LOS or charges (total or covered) are removed

ii) Cases for Maryland and all inclusive rate providers are removed

iii) Cases with LOS < 7 days are excluded as being non representative of LTCH

iv) Cases are grouped into DRG cells. Where a cell has a volume of <25 cases the cases from the cell are collapsed into a low volume pool. The average charges of individual DRG cells within the pool are assessed and split into 5 similar groups (quintiles). The 5 low volume quintiles are treated as individual cells for purposes of weight calculation and ALOS determination.

v) Outlier cases defined as +/- 3σ from geometric mean of charge and per day charge within a DRG cell are removed.

vi) Where a case is determined to be a short stay outlier (see outlier description for definition) the case is counted as a fraction of a discharge determined by the ratio of the case LOS to the Geometric ALOS for the DRG cell.

vii) Weights are calculated using the Hospital Specific Relative Value (HSRV) method. The weights are iterated to convergence with maximum difference < 0.0001.

viii) Where weights are not monotonic they are adjusted.

ix) Where cells have no volume, weights are assigned administratively based upon clinical similarity to DRG cells with existing weights.

Cost Of Living Adjustment (COLA) – applied to facilities in Hawaii and Alaska

Outlier Payments –

i) High Cost Outliers – a fixed-loss threshold is set after which 80% of cost as determined by the cost to charge ratio is paid as an outlier. The minimum loss threshold is set to deliver 8% of total payments as high cost outlier payments. This threshold is set at $20,738 for RY2008.

ii) Short Stay Outliers (SSO)– a case where the LOS is found to be < 5/6 of the geometric mean LOS for the DRG cell is considered a short stay outlier. Payment, where the SSO is above the IPPS comparable threshold, is made at the lesser of:

  a. 100% of cost;
  b. 120% * LTC DRG Per Diem (Standard Payment / Geo ALOS for cell)*LOS
  c. LTC Standard payment.

Where the LOS for a SSO is equal to or below the "IPPS comparable threshold", defined as the geometric average length of stay (Geo ALOS)[1] plus one standard deviation for the comparable DRG under the IPPS payment system, payment is made at the lesser of:

  a. 100% of cost;
  b. 120% * LTC DRG Per Diem (Standard Payment / Geo ALOS for cell)*LOS
  c. LTC Standard payment.
  d. IPPS DRG Per Diem (Standard Payment / Geo ALOS for cell)*LOS
  e. IPPS Standard Payment

Short stay outliers may also qualify for high cost outlier payments

System Development

In developing the original payment system various parameters were tested for their impact upon case level cost in the original report. A summary of the original findings follows:

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[1] The May 2007 Federal Register does not specifically state "geometric" however transmittal 1258 June 15 2007 CR 5652 states geometric

Labor Share: Coefficient found initially to be low and insignificant – this was subsequently constructed outside of regression model and operates in conjunction with wage data obtained from outside of the pool of LTC hospitals.

Urban Adjustment: This was initially found to be significant (19%) between urban and rural but not to differ significantly between large urban and other urban. Rural hospitals made up a small (6%) portion of the sample and given known data incompleteness the adjustment was not incorporated. It should be noted that any future adjustments will need to reflect geographic differences over and above those represented in the area specific wage index being used.

DSH: The regression analysis faced incomplete data issues with the component parts of the DSH index moving in different directions. SSI was suggested as a potential basis for adjustment pending future re-evaluation. No adjustment was adopted.

IME: This was evaluated and not found to be significantly correlated - potentially due to the low incidence of teaching amongst LTCH.

COLA – Insufficient data to make judgment

Outlier Policy: Detailed policy implementation as noted above aimed at creating incentives for efficiency and appropriate payment while creating disincentives to treat patients more suitably cared for at acute hospitals.

<u>Methodology</u>

Adhering to the existing payment parameters and policy choices the areas for potential adjustment outlined above are reevaluated. As with the majority of analyses that review payment adequacy, the system is assessed by its ability to match incurred costs. Since the given objective is to identify potential payment policy adjustments that recognize hospital level cost variations the focus of analysis is at the level of the hospital.

The current payment model covers average case level cost at hospital "h" as follows:

$$\text{Avg Cost Per Case}_{(h)} = \alpha * \text{CMI}_{(h)} * \text{WI}_{(h)} * \text{COLA}_{(h)} + \varepsilon$$

The error term ε includes both the actual variation of payment from cost and the additive impact of outlier policy adjustments. The standard base rate is given by α.

The payment model was assessed using the double log functional form. The advantages of using this specification are its direct applicability to the existing payment model and the treatment of variables as independent coefficients understandable as elasticities.

Since outlier policy is considered within the error term the model can be reduced to an ordinary least squares regression as:

$$\text{Ln (CPC)} = \alpha + \beta_1 \text{ Ln(CMI)} + \beta_2 \text{ Ln (WI)} + \beta_3 \text{ Ln (COLA)} + \varepsilon$$

Using the LTCH claims data set for discharges in Federal Fiscal Year (FFY) 2006 (10/01/2005 – 09/31/2006) used to construct the RY08 weight release, 376 hospitals were identified as having claims data available for inclusion. The impact of hospital and regional variations on the payment system is associated with the volume of services provided to Medicare beneficiaries, therefore regression results were weighted by the volume of cases treated.

Cost per case values were constructed by applying hospital specific cost to charge ratios (CCR). Outlier payments, as previously stated, are considered as part of the error term and the focus of separate policy considerations.

Hospital Level Regressions

Using Ordinary Least Squares (OLS) weighted by cases the existing payment parameters were tested.

The initial set of results are shown in Table 1 below and summarized as:

$$\ln(\text{CPC}) = 10.5 + 0.814 \ln(\text{CMI}) + 0.525 \ln(\text{WI}) + 2.06 \ln(\text{Cola})$$

Table 1: Initial Hospital Level Regression Using CMS V25 Weights

Predictor	Coef	SE Coef	T	P
Constant	10.4508	0.0104	1007.10	0.000
Ln(CMI)	0.8144	0.0523	15.57	0.000
Ln(WI)	0.5248	0.0809	6.49	0.000
Ln(Cola)	2.0590	1.3420	1.53	0.126

S = 3.39756   R-Sq = 44.9%   R-Sq(adj) = 44.5%

The existing payment model explains cost variations across hospitals, before outlier policy intervention, consistently with previous estimates. That is the adjusted R^2 for the RY 2006 data set is 44.5% compared to 44% for the RY 2000 data used to analyze the initial system design. It should be noted that the previous data set contained 222 hospitals rather than 376 and that the initial specification contained a control variable of bed size that would tend to improve adjusted R^2 results. Total beds and occupancy are potential control variables for adjusting observed significant relationships that may reward inefficient production. Not controlling for efficiency allows correlated variations between hospital types, region and scale to enter the initial assessment of potential parameters without adjustment. Current cost report data lacks complete reporting of total available beds and total days provided at the facility limiting the ability to control for inefficiency.

The objective of this analysis is to identify potential adjustments to improve accuracy hence it may be appropriate to subsequently incorporate a control variable once a significant relationship is identified to refine parameter magnitudes.

As a check on the accuracy of reported data 4 hospitals were identified as having case mix adjusted cost per case amounts greater than 3 standard deviations from the geometric mean. The data from these hospitals was removed and the model retested. The four hospitals accounted for 303 of 119,854 cases (0.25%). The use of the exclusion led to only slightly differing results in the magnitude of coefficients and no change in the adjusted R^2 of 44.5%. Lacking definitive evidence of the hospitals as significant data anomalies they were retained for completeness.

The result for the CMI statistic is significant. The coefficient for ln(CMI) is 0.8144 which means that a 10% increase in the observed CMI value is expected to result in an 8.07% change in the average cost of cases treated by the hospital.

The wage index coefficient was found to be significant and approximately 0.53. In keeping with the previous explanation a 10% rise in the wage index is expected to incur a 5.13% increase in hospital cost. The current labor share statistic is given as approximately 76% rather than 51% indicating the proportion of labor share may be set too high relative to the wage indices being used. Since the wage index is calculated from IPPS data and the labor share calculated outside of the directly observed LTCH costs, labor portion used for LTC PPS may be an area considered for further review.

The third coefficient, COLA, applied to only one hospital and is included for completeness. While it is not found to have a significant relationship it also has little overall policy bearing.

A central complicating issue in assessing the appropriateness and magnitude of potential system adjustments is the large change in case mix measurement associated with the move towards MS-DRGs.

New Parameters

In keeping with questions raised during the design of the LTC PPS the question of whether an adjustment is required for indirect teaching costs, providing care for indigent populations and additional urban/rural variation was addressed.

In keeping with the familiarity of existing variables used in the IPPS the following variables were tested:

Indirect Teaching Costs – Assessed using the interns and residents-to-beds ratio (resbed ratio). This is calculated as the number of interns & residents divided by the number of beds obtained from cost report data.
Additional cost for treating poorer populations – Assessed using 3 measures with data obtained and definitions provided from the RY08 LTC impact file published by CMS:

Medicaid Percent (MA%) - Calculated as the ratio of Medicaid/Non-Medicare Days to Total Days obtained from cost report data

Supplemental Security Income Percent (SSI%) - Supplemental Security Income Percent calculated as the ratio of Medicare SSI days to Total Medicare days. SSI days are obtained from the Social Security Administration. Total Medicare days are obtained from cost report data.

DSH Percent (DSH%)- Disproportionate Share Percent computed from data obtained from cost report data and Social Security Administration data. DSH Percent is calculated by adding the Medicaid Percent to the SSI Percent.

Urban/Rural Variation - Urban/rural designations based on the CBSA-based labor market area definitions based on the physical location of the LTCH from cost report data: "Lurban" = large urban area; "Ourban" = other urban area; and "Rural" = rural area.

Additional Parameter Regressions

The result for the tested ordinary least squares (OLS) regression is given by:

$$\ln(CPC) = 10.4 + 0.819 \ln(CMI) + 0.599 \ln(WI) + 1.99 \ln(Cola) - 0.195 \ln(1+MA\%) + 0.217 \ln(1+SSI\%) + 0.0378\ Rural + 0.0073\ Urban - 0.20 \ln(1+ResBed)$$

Where Urban, Rural and Large Urban areas are treated as dummy binary variables with Large Urban contained in the intercept and results are weighted by hospital case volumes.

The full results are given in table 2.

Table 2: Hospital Level Regression Using CMS V25 Weights: Testing New Parameters

Predictor	Coef	SE Coef	T	P
Constant	10.4362	0.0234	446.81	0.000
Ln(CMI)	0.8194	0.0549	14.92	0.000
Ln(WI)	0.5986	0.1080	5.54	0.000
Ln(Cola)	1.993	1.3470	1.48	0.140
Ln(1+MA%)	-0.1952	0.1209	-1.61	0.107
Ln(1+SSI%)	0.2166	0.1750	1.24	0.217
Rural	0.0378	0.0581	0.65	0.515
Urban	0.0074	0.0248	0.30	0.767
Ln(1+ResBed)	-0.2040	2.0470	-0.10	0.921

S = 3.39908   R-Sq = 45.6%   R-Sq(adj) = 44.5%

It can be seen that the additional variables add no explanatory power in terms of adjusted R^2 and no variable is found to be significant. In fact the most significant of the new variables is that for the percentage of MA days where the direction of the coefficient indicates the presence of lower rather than higher hospital costs.

Removing variables that were not statistically significant and substituting DSH % for MA% and SSI % (the component pieces) failed to identify a significant statistical correlation between the variable and hospital costs.

The Interaction of Outlier Policy

So far outlier policy has been treated as a correction to the error term existing outside of the payment policy. This is a simplification as in fact the operation of outlier policy within the LTCH payment has been designed to increase the homogeneity of case types treated at LTC hospitals.

The current system employs a series of adjustments to identify short term outlier cases and to integrate their payment with acute care prospective payments. These adjustments are outlined earlier in brief. The choice of an outlier pool size for high cost outliers, currently 8%, is a policy decision that trades off the potential loss for an extraordinary case with an unambiguous incentive to efficiently medically manage complex cases.

To review the impact of outlier policy across the payment system case level payments were calculated. Inlier payments were calculated for each case along with outlier payment adjustments, positive for high cost outliers and negative for short stay outliers. The ratio of outlier adjusted payment to pure inlier payment was used to calculate a case fraction for each case. If the inlier payment is unadjusted by outlier policy the fraction equals 1. If outlier policy generates more payment (high cost) the fraction is greater than 1. If outlier policy deducts payment from a standard inlier amount the fraction is less than 1. Equivalent case fractions are then used to derive the average cost per case at each hospital used within the regression.

The summary result for the OLS regression is given below with full results in Table 3:

$$\ln(CPC\_EQUIV) = 10.6 + 0.865 \ln(CMI) + 0.584 \ln(WI) + 1.28 \ln(Cola)$$

Table 3: Hospital Level Regression Using CMS V25 Weights: Equivalent Cases

Predictor	Coef	SE Coef	T	P
Constant	10.5687	0.0077	1372.42	0.000
Ln(CMI)	0.8652	0.0388	22.29	0.000
Ln(WI)	0.5842	0.0600	9.73	0.000
Ln(Cola)	1.2841	0.9961	1.29	0.198

S = 2.52131   R-Sq = 62.8%   R-Sq(adj) = 62.5%

The most noticeable effect of including outlier policy is the increase in the adjusted R^2 value from 44.5% to 62.5%. The coefficients for both CMI and WI have increased with the introduction of outlier policy. The CMI coefficient, ln(CMI), is 0.8652 which means that a 10% increase in the observed CMI value is expected to result in an 8.60% change in the average cost of cases treated by the hospital. The wage index coefficient, ln(WI), is 0.5842 which means that a 10% rise in the wage index is expected to incur a 5.73% increase in hospital cost, again different from the 76% projected by the labor share statistic. The parameters shown in the table 2 results were once again tested to review if the adjustments of outlier policy revealed systematic variations previously hidden. Once again no significant relationships were found (results are contained in Appendix A)

Conclusions and Recommendations

There are two key findings for LTC hospital payment policy. First, at present, analysis of additional payment policy variables used in the IPPS does not support the inclusion of any additional adjustment factors within the LTC PPS. Second, the data indicate that the current labor share percent (76%) may overstate the average marginal impact of wages on hospital cost. A labor share of 52% - 62% will most closely match hospital cost. Though this is below the 76% employed today, the difference is not large. Given that the hospital industry frequently requests stability in payment parameters and that 76% has long been accepted, this argues for no change in this parameter at this time.

Of course, over the longer term, these variables, or others hypothesized to identify similar features, may warrant future evaluation as data collection and reporting improves (ie coding responds to MS DRGs) and hospital responses to prospective payment system changes evolve. The hospital industry has been dynamic and this is likely to continue. CMS is also dynamic. For example, the agency recently introduced improved severity adjusted DRGs. These trends will need to be monitored and potential changes and improvements assessed as required by the rapidly changing U.S. healthcare environment.

Appendix A

The summary result for the OLS regression is given below with full results in Table 4:

$$\ln(CPC\_EQUIV) = 10.6 + 0.876 \ln(CMI) + 0.617 \ln(WI) + 1.23 \ln(Cola) - 0.150 \ln(1+MA\%) - 0.026 \ln(1+SSI\%) + 2.08 \ln(1+ResBed) + 0.0305\ Rural + 0.0051\ Urban$$

Table 4 : Hospital Level Regression Using CMS V25 Weights : Equivalent Cases and New Parameters

Predictor	Coef	SE Coef	T	P
Constant	10.5738	0.0173	610.31	0.000
Ln(CMI)	0.8757	0.0407	21.50	0.000
Ln(WI)	0.6168	0.0801	7.70	0.000
Ln(Cola)	1.2318	0.9994	1.23	0.219
Ln(1+MA%)	-0.1503	0.0897	-1.68	0.095
Ln(1+SSI%)	-0.0257	0.1298	-0.20	0.843
Rural	0.0305	0.0431	0.71	0.479
Urban	0.0051	0.0184	0.28	0.781
Ln(1+ResBed)	2.0790	1.5180	1.37	0.172

S = 2.52127   R-Sq = 63.3%   R-Sq(adj) = 62.5%