



Evaluation of the Proposed Coding Adjustment for Home Health Prospective Payment System for CY 2011

Prepared for: National Association for Home Health and Hospice

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Purpose

The Lewin Group was commissioned by National Association of Home Health and Hospice to study the appropriateness of the proposed coding adjustment to the home health (HH) prospective payment system (PPS) for calendar year (CY) 2011 to account for apparent increase in case mix index.

Section 1895(b)(3)(B)(iv) of the Balanced Budget Act of 1997 specifically provides the Secretary of Department of Health and Human Services with the authority to adjust the standard payment amount if the Secretary determines that the case mix adjustments resulted in a changes in total payments that are the result of changes in coding or classification of different units of services that do not reflect real changes in case mix index. The Centers for Medicare and Medicaid Services (CMS) proposes to implement a negative 3.79 percent coding adjustment for CY 2011 and 2012 based on analysis performed by its contractor, Abt Associates, Inc.

The first section of this report CMS' rationale for the coding adjustment. Next, we critique the logic used by CMS to support the proposed coding adjustment. In the third section, we provide the results of our analysis on health characteristics as it relates to CMI and as reported in OASIS. Finally, we provide a discussion of relationship between CMS logic and our analyses of the case mix issues.

CMS Rationale for the Coding Adjustment

In October 2000, CMS implemented a prospective payment system for home health. Medicare payment, which is for a 60-day episode, is based on local wage levels and a measure of the relative cost of the episode. The episode is classified into a home health resource group (HHRG) based on the patients characteristics at the beginning of the episode and on his or her use of rehabilitation services. Medicare used an 80-group HHRS until January 2008, when it converted to a 153-group system. CMS arrived at the proposed coding adjustment based on the analysis performed by its contractor, Abt Associates.

Abt Study Methodology

Abt analyzed case-mix in three years – 2000, 2007, and 2008 – finding that the average case-mix increased 19.40%. A key issue of payment policy is the extent to which this change represents a real increase in the resources needed to treat the beneficiaries receiving home health services. Alternatively, the measured increase in case-mix may represent changes in how HHAs report diagnoses and changes in the rehabilitation services that physicians prescribe and HHAs deliver.

Consistent with analyses of case-mix change in prospective payment for other services (e.g., inpatient hospital), Abt predicted what case-mix would have been if the relationship between case-mix and certain variables not under the control of the HHA had remained constant. For the 2000-2007 period, the 2007 case-mix is predicted, and the actual 2000 measured case-mix is used.

Using episode-level data from 2000, the case-mix is regressed on a large number of variables in these categories:

- Personal characteristics
 - o Demographics: age, gender, and race/ethnicity
 - o Living arrangements, e.g., whether lives alone or with spouse (available from OASIS data but not used in the 2008 analysis)
- Medicare inpatient utilization and cost
 - o number of days in hospital, inpatient rehabilitation, and SNF stays within 120 days prior to the home health episode
 - o payments for hospital, inpatient rehabilitation, and SNF stays within 120 days, which are measures of intensity of service use
- Measures relating to hospital inpatient history (especially the most recent hospitalization)
 - o APR DRG type (procedure or medical)
 - o Hospital diagnosis (APR DRG)
 - o Mortality risk at the time of hospitalization (one of four subclasses, a part of the APR DRG algorithm)
- HHA ownership type, e.g., free-standing proprietary

Abt Study Results

In the 2000-07 period, the case-mix was measured to be 1.0959 in the base period (2000) and 1.2606 in the end period (2007), representing a 15.03% increase. The case-mix predicted for 2007 was 1.1152, implying an increase of only 1.76%, which is less than an eighth of the measured increase over the seven year period.

In the 2007-08 period, the change in measured case-mix was 4.25%. The case-mix predicted for 2007 (based on the regression of 2008 data) was 1.306, implying an increase of only 0.19%, which is less than a twentieth of the measured increase.

In the combined period (2000-08), the change in the measured case-mix was 19.40%. The case-mix based on predicted values $-1.76\% + 0.19\%$ is 1.95%. The measured increase is about 10 times the predicted increase.

As an example to apply the methodology, consider the results for beneficiaries who had a knee or joint replacement. The 2000 regression found that having had a joint replacement increases the case-mix by 0.215 (Table 5, Abt). Consider two beneficiaries, one of whom had the average case-mix of 1.0959 and a second with the identical characteristics except for having a joint replacement. The case-mix of the latter would be 1.310 (1.095+.215), or 19.6% higher than without the joint replacement. In the 2000-07 period, the percentage of beneficiaries with joint replacements increased 1.05 percentage points, from 2.76% to 3.82%, a 38% increase in the proportion of home health patients with joint replacements. Based on this, Abt inferred that the increase in the proportion of beneficiaries with joint replacements increased the case-mix by 0.0022 (.215*.0105). Based on the relative weight of the joint replacement cases, the case-mix would have increased from 1.0959 to 1.0981, or 0.2%.

Some changes were negative. For instance, the variable for having no recent inpatient stay (i.e., hospital, IRF, or SNF) within 14 days of the start of the HH episode had a coefficient of -0.043. The percentage of episodes with no recent inpatient stay increased by 8.3 percentage points, from 51.8% to 60.1% or a 16% increase. By itself, this would have impacted the case-mix by -0.0036 (-0.043×0.083).

Critique of the CMS Methodology

There are several issues associated with the Abt analysis. It is unclear which variables are derived from OASIS assessments. As living arrangement was a variable excluded from the 2008 data, Abt intentionally mentions that it is derived from agency reported data. The 2000 regression dropped one-sixth of the episodes because of missing OASIS report.

The key assumption of the methodology is that the relationship between real case-mix (i.e., the resources needed to treat a patient) and the variables that are not under control of the HHA is stable over the study period. In particular, the regression estimated in 2000 is assumed to not have changed by 2007, particularly the regression coefficients. The longer the period, the more questionable this assumption.

Only 39 percent of the Home Health Episodes were Preceded by an Inpatient or Post Acute Care Setting Stay¹

Of the 39 percent of the home health episodes preceded by a hospital inpatient or post acute care facility stay, a smaller proportion of the episodes were preceded by an inpatient stay in 2007. Given that APR-DRG and the APR-DRG risk of mortality were used as key independent variables to measure patient acuity, it is somewhat disingenuous since the APR-DRG and APR-DRG risk of mortality were relevant for a small proportion of home health episodes preceded by short term acute care hospital. It is also surprising that Abt does not use the severity level in their regression analysis.

No Explanation Provided on the Choice of Periods

It is unclear why Abt subdivided the 2000-08 period in 2007. Abt used two alternative approaches. First, Abt used the 2000 regression results to predict case-mix in 2008. When classification systems such as DRGs are modified, they are usually done so in a budget neutral fashion. Mechanically, CMS probably recalibrated 153-HHRG such that it yielded the same average case-mix as 80-HHRG, using 2006 data. So that without any changes in agency behavior, case-mix in 2008 should have been the same regardless of whether the 80- or 153-HHRG was used.

Second, to minimize the possibility for shifts in the relationship between resource requirements and explanatory variables, Abt could have subdivided the 8-year period into half or at least performed some sensitivity analysis to choose the time periods. It could have used a 2000 regression to predict case-mix in 2004, and a 2004 regression to predict case-mix in 2008.

¹ Medicare Payment Advisory Commission, "March 2010 Report to the Congress," Chapter 3B, p.201.

Drop in Inpatient Length of Stay

In 2008 inpatient providers (hospitals, IRFs, and SNFs) may have discharged their patients earlier than they did in 2000.² Earlier discharges are associated with higher resource needs upon discharge (“quicker & sicker”). The Abt report specified its regression to allow for this possibility by including pairs of variables. In the case of acute care hospitals, there was a dichotomous variable for whether the patient had any hospital stay in the preceding 14 days and a variable for the number of acute care hospital days in the preceding 14 days.

To understand the implications for coefficients, consider three patients:

1. One with no recent hospital stay,
2. One with a recent stay that had above average in length, and
3. One with a recent stay that had below average in length.

Presumably, the home health care resources would be greatest for the shorter-stay patient, least for the no-stay patient, and in between for the longer-stay patient, given that Abt controlled for the APR DRG and severity of illness. If so, the coefficient for any stay would be positive and the coefficient for the number of days would be negative. That is, given a hospital stay, the shorter the stay, the greater the resources needed upon discharge.

| | Any stay in preceding 14 days | Number of acute care hospital days in preceding 14 days | Interpretation |
|------------------|--------------------------------------|--|---|
| Quicker & Sicker | Expected + | Expected - | Having a hospital stay would increase HH resources, but the longer the stay, the less HH resources |
| 2000 Regression | -0.8141 | 0.00782 | Having a hospital stay results in less HH resources than someone admitted from the community and the longer the hospital stay the more HH resources |

A source of concern is that the estimated coefficients are not consistent with these expectations. In the 2000 regression, the coefficient for any hospital stay was -0.8141 and the one for the

² In its discussion of Table 5, Abt notes that mean hospital days (mean among HH episodes, not average overall length of hospital stays) decreased from 2.258 in 2000 to 1.438 in 2008.

number of acute hospital days was 0.00782 (Table 5, Abt). Even though these variables are cited as one of the few “drivers of real case-mix change”, there is no discussion of what signs of their coefficients should have to be consistent with the quicker-sicker impact on needed resources.

More generally, the Abt report does not discuss what signs are consistent with known relationships, and hence, it is not in a position to judge the signs of the coefficients. At best, the Abt study seems more like an exploratory exercise than a scientific study with definitive results.

Problems with Multicollinearity

The Abt regressions include more than 800 independent variables, largely because of the many variables for APR DRGs and interaction terms. Normally, large numbers of independent variables can be problematic, because the multicollinearity among variables lowers the precision of the coefficients. As a result, a group of conceptually related variables may be significant without any of those variables being significant by themselves. Abt justifies the use of large number of related independent variables by stating that the key metric here is the ability to predict the dependent variable, not determine which independent variables are important in this role. However, several researchers have opined that multicollinearity may result in wrong signs and magnitudes of regression coefficient estimates, and consequently in incorrect conclusions about relationships between independent and dependent variables. This may partly explain the unexpected signs of the regression coefficients. It is worth noting that Abt does not perform any multicollinearity diagnostic statistics or consider the remedy of combining some of the independent variables. It is also worth mentioning that Abt used a large number of independent variables that did not have much variation. The lack of variation in the values of the dependent variables and the close interaction among them is likely to pose problems with the prediction of the dependent variable.

Difference in R-Square

The regression with 2000-07 data explained 19 percent of the variance at the episode level (that is, had an R-square of .19), but the regression with 2007-08 data explained only 10 percent of the variance. A partial explanation for this decrease is that living arrangements were dropped from the second regression due to many missing values. Abt mentioned the change in dependent variable, from the 80-group model to the 153-group model. Contrary to these results, the R-square for 80 HHRG at 0.21 was much lower than the R-square of 0.44 for 153 HHRG. This suggests that the R-squared should have been higher for the regression 2007-2008 data. Like some of the other unexplained results, the reason for this decrease in statistical performance is unclear and unexplored.

Lack of Consistency in CMS' Approach for Estimating Coding Adjustment

Over the past four years, CMS has proposed and applied coding adjustment to most post acute care sectors, including long term care hospitals, inpatient rehabilitation facilities and home health agencies. It is worth mentioning that CMS has estimated the coding adjustment in different ways for each sector and even within the same sector across two different years. It has

been difficult to ascertain if the differences in the methodology for estimation of coding adjustment emanate out of different CMS departments or CMS contractors.

Analytical Results Evident of Real Case Mix Growth

Change in Acute Care Case Mix Index from 2002 to 2005 for Cases Discharged to Home Health Agencies

The acute care (inpatient prospective payment system (IPPS)) CMI for cases discharged to home health agencies reflects the patient severity of the patients discharged to home health agencies. As one of the measures for patient severity is prior hospitalization, it is believed to be unaffected by the home health CMI. The CMI for the prior hospitalization can be assumed to be a proxy measure of the “real” case mix index. Based on our analyses of the 2007 and 2008 MedPAR data (Medicare discharges from short term acute care hospitals, we found that the CMI (MS DRG-based CMI) of cases discharged to home health agencies increased by 2.5 percent from 1.588 in 2007 to 1.63 in 2008.

Furthermore, we also found that among the acute care cases discharged to home health agencies, the proportion of cases categorized as Medicare Severity Adjusted Diagnosis Related Groups (MS DRGs) with complications and comorbidities increased by 3 percentage points from 25 percent in 2007 to 28 percent in 2008. This implies that the real case mix index due to comorbidities most likely increased for the cases discharged to home health agencies.

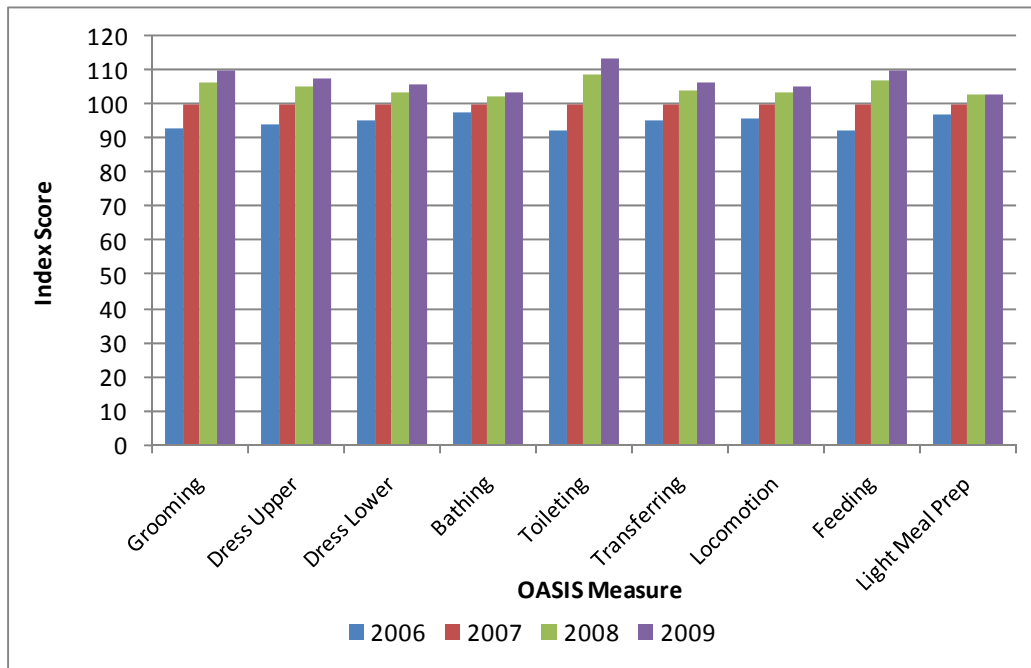
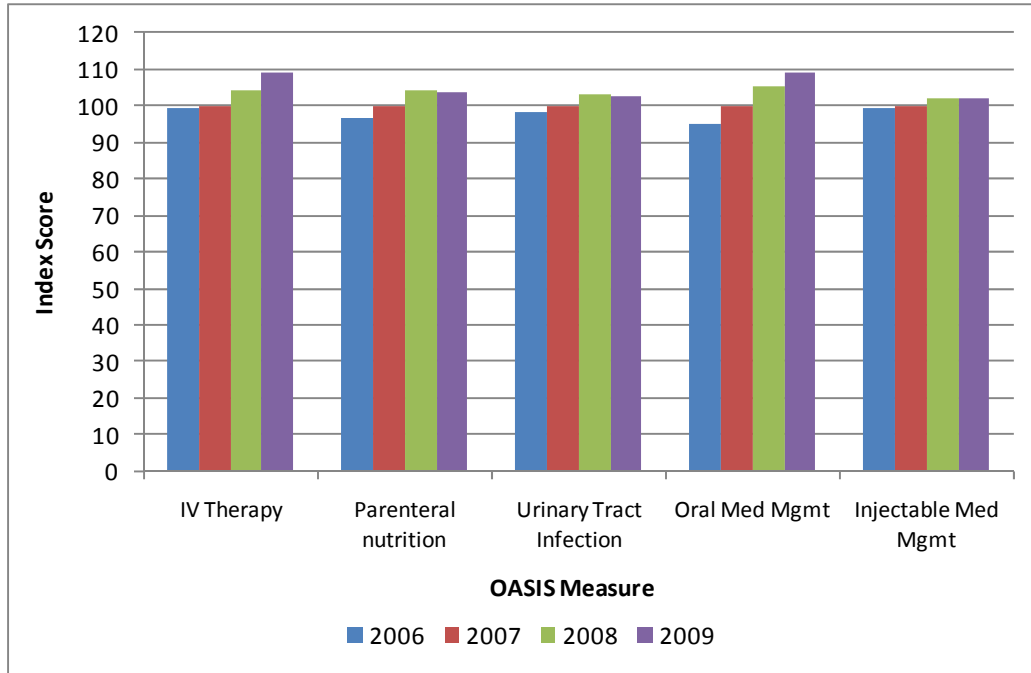
Given that Medicare pays short term acute care hospitals based on MS DRGs, it may be a more reliable and independent method to measure changes in case mix index compared to APR DRG. At least 2.5 percent of the change in case mix index for home health episodes can be attributed to change in patient acuity compared to the 1.76 percent based on Abt’s regression.

Increase in Patient Acuity Based on Non-Case Mix Related OASIS items

Health characteristics reflected in OASIS indicate a shift in the care of home health patients since the advent of PPS. CMS’ conclusion that the total change in the CMI between 2007 and 2008 does not reflect a change in “real CMI” may not reflect valid reasoning. As shown in Exhibit 1, non-case mix related OASIS items, such as grooming and light meal preparation have shown increasing functional limitations among home health patients. A MedPAC report also shows that the home health episodes have resulted in higher percent of functional improvement over time.³ This might explain the increase in therapy visits over time.

³ Medicare Payment Advisory Commission, “March 2010 Report to the Congress,” Chapter 3B, p.201.

Exhibit 1: Index ADL Score for All Episodes (2006-2009)



Inherent Problems with Home Health Prospective Payment System

A key driver of the increase in the home health case mix index since the advent of PPS appears to be the result of an increase in the number of therapy visits. Changes to the clinical and functional components results in slight changes to the case mix index. However, the services utilization component of the home health PPS case mix was included in the case mix because the traditional clinical and functional component explained a relatively small amount of the variation in resource use. This implies that the service utilization component explained a major portion of the resource use variation. However, many of the changes in the patient characteristics, such as discharge of joint replacements to home health agencies, indicates a greater need for physical and occupational therapy. Also, the greater proportion of cases needing assistance with transferring and ambulation are also suggestive of a greater need for physical and occupational therapy.

The 153 HHRG system provided payment incentives to home health agencies to treat patients with secondary complications and comorbidities. Prior to the implementation of 153 HHRG, HHA were not paid adequately for patients with complications and comorbidities.

Conclusion

CMS relies on the Abt study to support the contention that home health agencies upcoded Medicare home health episodes between 2007 and 2008. As discussed above, the Abt report includes a number of flaws. These include:

- The inclusion of a service component (therapy visits) as a PPS element allows the CMS the opportunity to allege “upcoding” practices among the providers because CMS has not yet built a predictive model that associates clinical and function component with the service utilization component.
- Only 39 percent of the home health episodes are preceded by facility based stay in short term acute care hospital or post acute care
- Abt selected a large number of explanatory variables without providing a rationale. Many of these explanatory variables interacted with other explanatory variables leading to multicollinearity and wrong signs of regression coefficients.
- Abt basically assumes that the relationship of the preceding clinical event and the home health episode will be same over the period of 2000 to 2007. Factors like the length of stay are not expected to change over time.
- Abt provides no rationale on the selection of the study periods of 2000 and 2008.

- Despite an improvement in explanation of resource under 153 HHRGs, Abt had a lower R-square with 2008 data using 153 HHRGs compared to 2000 data using 80 HHRGs.

With the search for cost effective post acute care provider, short term acute care hospitals and post acute care providers are likely to discharge patients sooner and quicker to home health.⁴ This phenomenon is likely to result in patients with higher acuity receiving treatment in home health. Our analysis shows that individuals discharged from short term acute care hospitals have increasing acuity levels, so greater acuity levels of home health patients would be expected. The CMI of hospital discharges to home health has increased by 2.5 percent between 2007 and 2008. We also observed several non case mix related OASIS items exhibiting an increase in patient acuity.

⁴ Richard Boher, John Newell and David Torchiana, "The Effect of Decreasing Length of Stay on Discharge Destination and Readmission After Coronary Bypass Operation," Surgery, March 2002,