MDS-Based State Medicaid Reimbursement and the ADL-Decline Quality Indicator

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Purpose: We examined the relationship between the quality indicator for decline in activities of daily living (ADL) and the use of the Minimum Data Set (MDS) for determining Medicaid skilled nursing facility reimbursement. Design and Methods: We conducted a cross-sectional analysis using the 2004 National MDS Facility Quality Indicator reports as the dependent variable in a multilevel regression model. Our primary explanatory variable was a state-level binary variable distinguishing whether or not the state used an MDS-based Medicaid-reimbursement system in 2004. We obtained control variables through the Online Survey, Certification, and Reporting System. Results: Skilled nursing facilities located in states that used the MDS for Medicaid reimbursement reported more ADL decline than did facilities in states that did not use the MDS for reimbursement. Implications: The finding suggests that the ADL-decline quality indicator captures more than just quality, including state-level policy differences. Therefore, the ADL-decline quality indicator should be investigated and refined prior to being relied on for pay-for-performance initiatives.

Key Words: Incentives, Medicaid, Quality indicators, Reimbursement, Skilled nursing facility

One important measurement tool used by the Centers for Medicare and Medicaid Services (CMS) and state health regulators is the Minimum Data Set (MDS), which captures skilled nursing facility (SNF) residents’ physical and mental health, functionality, and general well-being. SNFs are required to assess all residents in Medicare- or Medicaid-certified facilities within 14 days of admission, quarterly, annually, after significant changes in resident status, and when corrections are made to prior assessments (CMS, 2002).

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tion for an increase in acuity after a case-mix reimbursement system is adopted is that that when SNFs are reimbursed through a case-mix Medicaid-reimbursement system, they have a greater incentive to document more severe ADL dependency and declines in ADL status in order to capture higher daily reimbursement amounts.

Whereas previous research has examined the overall increase in the case-mix index after implementation of case-mix reimbursement systems (Feng et al., 2006), this research specifically looks at the ADL-decline QI in order to identify whether the use of the MDS for reimbursement is associated with differences in this QI. In examining this question, we find that the ADL-decline QI is particularly interesting because ADLs are such a prominent factor in the RUG-III reimbursement system (CMS, 2000).

Because some states use the MDS for Medicaid reimbursement and some do not, we hypothesize that facilities operating in states that use an MDS-based case-mix reimbursement system will report more ADL decline, as reflected by the ADL-decline QI. The findings have important implications for the use of the MDS for both case-mix-based reimbursement and quality monitoring and improvement.

**Methods**

**Study Population**

We restricted our study sample to SNFs with greater than 20 residents and that were located in the 48 contiguous United States. We eliminated Medicare-only certified facilities because they would not be directly affected by incentives in the Medicaid-reimbursement systems. We eliminated approximately 100 more facilities from the sample because there were reportedly more residents than certified beds, thus suggesting erroneous data (Konetzka, Yi, Norton, & Kilpatrick, 2004). After these restrictions were met, we found that there were 12,898 SNFs with complete Online Survey, Certification, and Reporting and MDS QI data.

**Dependent Variable**

We used the ADL-decline QI for each SNF as the dependent variable. This QI measures the percentage of residents whose need for assistance in self-feeding, transferring from one chair to another, changing positions in bed, and going to the bathroom has increased since their prior assessment. The ADL-decline QI is an incidence rate and describes the level of functional decline that a resident experiences between the latest MDS assessment and the one immediately before it. Excluded from the ADL-decline QI measure are residents who do not have a previous MDS assessment and residents whose previous assessment indicates that no further decline is possible (Center for Health Systems Research and Analysis, 1999). The ADL-decline QI measure is the same as the “percent of long-stay residents whose need for health with daily activities has increased” quality measure posted on the Nursing Home Compare Web site maintained by the CMS. With the exception of excluding residents who are in a coma, these measures are not risk adjusted.

In generating the dependent variable, we had the CMS National MDS Facility QI numerator–denominator reports for 2004 serve as our data source. Monthly numerator (number of residents with ADL decline) and denominator (total residents) data for each SNF in the sample were generated by the CMS. Monthly percentage values were calculated and yearly averages were generated to control for monthly instability (Mor et al., 2003). The ADL-decline QI had a mean of 16.5%, meaning that the average SNF saw an ADL decline in 16.5% of the residents. The distribution of the ADL-decline QI was skewed to the right, and therefore we used the square root of the QI value for our statistical analysis to obtain a more normal distribution. We used the square-root transformation in lieu of the log-normal transformation because it better approximated the normal distribution and also retained the facilities that reported zero ADL decline.

**Explanatory Variables**

Using SNF data, the models examine both state-level and facility-level explanatory variables. The main explanatory variable of interest to us was a state-level binary variable distinguishing whether or not the state used an MDS-based Medicaid-reimbursement system in 2004.

Our hypothesis in this research was that the dual use of the MDS data for reimbursement and quality-monitoring purposes is associated with state-level differences in the ADL-decline QI, in which states that use the MDS for Medicaid reimbursement report more ADL decline. A rival explanation is that it is not the explicit use of the MDS, but rather the case-mix reimbursement methodology itself, that results in state-level QI differences. Therefore, the first control variable identified the states that did not have an MDS-based Medicaid-reimbursement system but used a case-mix system that was based on a different data source. For example, in 2004, Texas used an 11-category case-mix system (Texas Index for Level of Effort) that was based on a separate survey process.

We obtained the Medicaid-reimbursement system variables through an examination of existing reports that detail the structure of Medicaid-reimbursement systems (Harrington, Swan, Wellin, & Clemena, 2000; U.S. Government Accountability Office, 2002) and through a review of the state Medicaid plans and plan amendments located on the CMS Web site. Additionally, state Medicaid personnel confirmed...
the coding of these variables. In 2004, of the 48 contiguous states, 25 used an MDS-based case-mix reimbursement system, 10 used a case-mix reimbursement system based on a different data source, and 13 did not adjust for case mix.1

Another state-level explanatory variable was the average state daily SNF Medicaid rate. Previous research has found that higher Medicaid payment levels are associated with better quality outcomes in SNFs (Cohen & Spector, 1996; Grabowski, Feng, Intrator, & Mor, 2004; Grabowski & Angelelli, 2004; Intrator & Mor, 2004). Although the 2004 state Medicaid rates were not available for all states, Grabowski and colleagues reported the average state Medicaid rates for 2002, which were inflated to 2004 rates by use of the SNF price index. Among the 48 contiguous states, the average daily state Medicaid rate for 2004 ranged from $89 to $185, with an overall mean of approximately $127 and a standard deviation of $24.

In addition to state-level variables, we also examined a number of facility-level explanatory variables, on the basis of previous research findings that they are important factors that affect SNF quality (Spector & Fortinsky, 1998; Berlowitz et al., 1999; Castle, 2002; Harrington et al., 2000; Harrington & Swan, 2003; Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005; Hughes, Lapane, & Mor, 2000). These facility-level control variables include facility-level case mix (based on an index of ADLs concerning eating, toilet use, and transferring), staffing levels (total licensed nurse staffing hours per patient per day and certified nursing assistant staffing hours per patient day), facility ownership (for profit, nonprofit, and government), facility size, occupancy rate, percentage of residents in Medicaid, and metropolitan versus nonmetropolitan location. The primary data source for these facility variables was the Online Survey, Certification, and Reporting System. Table 1 details the distribution and summary statistics for each of the facility-level explanatory variables.

### Analysis Approach

Because of the multilevel nature of the data set (facilities nested within states), we used a multilevel or mixed regression model to account for the hierarchical structure of the data, and therefore produce correct standard errors (Rabe-Hesketh & Skrondal, 2005). We conducted all statistical analyses with Stata 9.1. First, we estimated a random-intercept model. Next, we estimated random-coefficient models in which the effects of the for-profit

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**Table 1. Summary Statistics for Facility-Level Explanatory Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Distribution</th>
<th>Summary Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADL acuity index</td>
<td>Continuous, normal</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Professional nurse staffing</td>
<td>Continuous, normal</td>
<td>7.96 (1.06)</td>
</tr>
<tr>
<td>CNA staffing</td>
<td>Continuous, normal</td>
<td>1.21 (0.34)</td>
</tr>
<tr>
<td>For profit</td>
<td>Binary (for profit = 1)</td>
<td></td>
</tr>
<tr>
<td>For-profit ownership</td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Nonprofit or government ownership</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>Nonmetro location</td>
<td>Binary (nonmetro = 1)</td>
<td></td>
</tr>
<tr>
<td>Nonmetropolitan area</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Metropolitan location</td>
<td></td>
<td>69</td>
</tr>
<tr>
<td>Facility size</td>
<td>Categorical</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td></td>
<td>113 (61)</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Large</td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>Percentage of Medicaid</td>
<td>Categorical</td>
<td>66.10 (17.80)</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>46</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Occupancy rate</td>
<td>Categorical</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>86 (13)</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

*Note: Explanations for variables are as follows. The ADL acuity index examines the average facility acuity based on eating, toilet use, and transferring; professional nurse staffing is the total licensed nursing staff hours per patient per day; and CNA staffing is the CNA staff hours per patient per day. Facility size is based on the number of licensed beds: small, <75 beds; medium, 75–149 beds; large, ≥150 beds. Percentage of Medicaid is based on the percentage of residents reimbursed under Medicaid: low, <60%; average, 60–80%; high, ≥80%. Occupancy rate is based on the percentage of licensed beds that are occupied: low, <80%; average, 80–94%; high, ≥95%. ADL = activities of daily living; CNA = certified nursing assistant.*
and the high-percentage-of-Medicaid variables were allowed to vary randomly over states. We examined these random coefficients because SNFs in states with an MDS-based Medicaid-reimbursement system would have a greater incentive to document higher acuity on the MDS if they were for profit and if they had a greater proportion of their residents reimbursed through Medicaid. We used likelihood ratio tests to determine the model that best fit the data.

Results

The intraclass correlation for the dependent variable was 0.158, so almost 16% of the variation in the dependent variable was due to between-state variation. Based on likelihood ratio tests, the best fitting multilevel model was the one that included both the for-profit and percentage-of-Medicaid residents as random coefficients. Table 2 details the results from this model. Of the three state-level variables, the use of the MDS-based Medicaid-reimbursement system was the only statistically significant variable, and we found it to have a strong \( p < .001 \) relationship with the ADL-decline QI, in which SNFs located in states with a MDS-based reimbursement system reported more ADL decline than did SNFs in other states not using an MDS-based reimbursement system.

As we stated previously, we used the square-root transformation because it better approximated a normal distribution and also retained the zero QI values in the data set. One drawback of the square-root transformation, however, is that it does not allow for the translation of the coefficients to specific changes in magnitude.

Multilevel models using the XT mixed command in Stata do not generate \( R \)-squared measures; however, it is possible to calculate an estimated \( R \) square based on the variances of the base random intercept and final model. The estimated \( R \) square is .053.

More ADL decline was also reported in facilities with higher facility case mix (statistically significant at \( p < .001 \)), higher levels of professional nurse staffing (\( p < .001 \)), facilities located in nonmetropolitan areas (\( p < .001 \)), and facilities with fewer than 60% of the residents reimbursed through Medicaid (\( p < .001 \)). In contrast, less ADL decline was reported in facilities with more than 80% of the residents reimbursed through Medicaid (\( p < .001 \)), facilities with fewer than 75 beds (\( p < .001 \)), and facilities with more than 95% occupancy (\( p < .01 \)).

Discussion

Using MDS data for the dual purposes of reimbursement and quality monitoring has the advantage of more efficient data collection compared with requiring separate data-collection efforts for these purposes. There is also the possibility, however, that the dual use of the MDS interferes with the intent of the quality-monitoring function, where the QIs are reflecting more than outcomes but also state-level policy decisions.

The primary finding of this study is that SNFs located in states with an MDS-based Medicaid-reimbursement system reported more ADL decline than did SNFs in other states not using this type of system. This does not necessarily imply that the use of MDS-based Medicaid-reimbursement systems is associated with poorer quality care, because previous research has critiqued the validity of the MDS QIs (Arling, Kane, Lewis, & Mueller, 2005; Mor, 2005) and the CMS has cautioned that these measures are not definitive quality measures but rather indicate potential problems that require further investigation (CMS, 2007).

It is more probable that the use of the MDS for Medicaid reimbursement gave SNFs an increased incentive to document ADL decline compared with facilities in states with other types of reimbursement systems. We found a strong positive association between the ADL-decline QI (as measured by the MDS) and the facility acuity index (based on three ADLs reported in the Online Survey, Certification,
and Reporting data), indicating that SNFs with higher case-mix levels experienced or recorded more ADL decline. Still, even after controlling for facility-level Medicaid acuity, we found that the use of the MDS in Medicaid reimbursement had a strong positive association with the ADL-decline QI, suggesting that the effect is more likely associated with ADL documentation on the MDS rather than overall SNF acuity or access to more dependent residents.

The positive association of for-profit ownership and the ADL-decline QI is consistent with previous research that found that for-profit ownership is frequently associated with poorer QIs (Hillmer et al., 2005). Furthermore, for-profit SNFs are accountable to their shareholders to make a profit, and this incentive to maximize profit has implications for the ADL-decline QI because for-profit facilities may document ADL decline more aggressively to obtain higher case-mix payments.

Additionally, the findings regarding the association of the QI with nonmetropolitan location, bed size, and occupancy are not out of the ordinary; previous research has shown mixed findings on the effect on SNF quality measures (Berlowitz et al., 1999; Carter & Porell, 2003; Coburn, Keith, & Bolda, 2002; Hughes et al., 2000; O’Neill, Harrington, Kitchener, & Saliba, 2003; Phillips, Holan, Sherman, Williams, & Hawes, 2004; Spector & Fortinsky, 1998; Zinn, Aaronson, & Rosko, 1993).

Two unexpected findings among the facility-level variables are the relationship between the ADL-decline QI and the professional nurse staffing variable and the variables measuring the percentage of residents reimbursed through Medicaid. The staffing variable finding is at odds with the preponderance of the existing research, which finds that more professional nurse staffing is associated with better health outcomes (Bostick, Rantz, Flesner, & Riggs, 2006). Because licensed nurses play an important role in the documentation of health conditions on the MDS, it is feasible that the positive relationship between the ADL-decline QI and professional nurse staffing variable exists because facilities that have more licensed nurses are more thorough in their documentation of ADLs on the MDS.

One would also expect that a higher percentage of residents reimbursed through Medicaid would result in a higher ADL-decline QI, because SNFs located in states with an MDS-based Medicaid-reimbursement system have an increased financial incentive to document ADL decline. For this reason, we examined an interaction effect between the variable for the state-level MDS-based Medicaid-reimbursement system and the variable for the high percentage of reimbursement through Medicaid. Although the interaction effect was positive, it was not statistically significant at $p < .05$ and did not substantially contribute to the overall power of the model according to likelihood ratio tests. The reasons for the overall negative relationship between the ADL-decline QI and the percentage of residents reimbursed through Medicaid are unclear and warrant further investigation.

Further research should also investigate how the dual use of the MDS for both reimbursement and quality monitoring affects data accuracy. It is quite possible that the conflicting incentives for ADL-decline documentation when the ADL measures are used for both reimbursement and quality monitoring result in better data accuracy as opposed to having the ADLs used for only one purpose. Because data accuracy is fundamental to the appropriate use of the ADL measures for reimbursement and quality, it is important that policy makers take steps to audit these measures and other QIs. In addition, the ADL-decline and presumably other QIs should be investigated and refined further prior to being relied on for policy purposes, such as pay-for-performance initiatives. In particular, SNFs in nearby areas that cross state borders should not be directly compared by use of the ADL-decline QI, as is currently possible on the Nursing Home Compare Web site. Instead, the ADL-decline QI and other relevant QIs should be adjusted to reflect state-level data biases.

It is necessary to acknowledge the limitations of this study. The first limitation is the cross-sectional approach, whereby the findings only indicate a correlation and not necessarily causation. Obtaining longitudinal data would allow for the tracking of the ADL-decline QI over time, particularly for states that have recently switched to an MDS-based reimbursement system.

A second limitation is that a state’s use of an MDS-based Medicaid-reimbursement system may not be random, and therefore there is the possibility of unobserved variable bias. For this reason, we correlated the state-level variable capturing the use of the MDS for Medicaid reimbursement with several other state-level variables not included in the model, such as Medicaid program size, the age and income distributions of the states’ populations, and other state policy variables. These variables did not have a statistically significant relationship with the use of the MDS-based Medicaid-reimbursement system; however, it is possible that other state variables not readily available, such as state differences in MDS training, technical assistance, and use of the MDS data for quality monitoring, could also help explain variation in the ADL-decline QI. Future research would benefit from the surveying of states to obtain these variables. Nevertheless, in this study the multilevel model assumes that SNFs operating in the same state are correlated and therefore accounts for the possibility that not all relevant state-level variables are specified.

Another limitation is that the data used in this analysis do not include resident-level data that may explain variation in the ADL-decline QI. The inclusion of resident-level data, in which residents are nested in SNFs, would allow for a more
individualized control for resident acuity in the model. Additionally, researchers have found that individual characteristics such as cognitive status are associated with the identification of health conditions on the MDS (Phillips, Chu, Morris and Hawes, 1993; Wu, Miller, Lapane, Roy and Mor, 2005). It is possible that ADLs and recognition of ADL decline are associated with resident variables such as age, race or ethnicity, and cognitive status, and thus models using resident-level data would yield more explanatory power.

In spite of these limitations, the findings from this study are important and suggest that the ADL-decline QI captures more than just quality, including state-level policy differences. Although this research cautions policy makers on using the ADL-decline QI at present, it is hoped that by further investigating and refining the QI, this measure can eventually help the public make informed decisions about long-term-care placement and encourage SNFs to improve the quality of care provided to their residents.

References


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End Notes

Most of the states classified as having an MDS-based Medicaid-reimbursement system rely on the 44 or 34 RUG-III groups. In West Virginia and Nebraska, the states did not use all of the MDS data used the in the RUG-III, and therefore we preferred the phrase “MDS-based reimbursement” over “RUG-III” system. For both West Virginia and Nebraska, however, the states used ADLs (as measured by the MDS) to classify residents into reimbursement groups.