

Risk Adjustment for Nurse Staffing Measures

Nursing Home Value Based Purchasing (NHVBP) Demonstration

Introduction

Under the NHVBP demonstration, CMS will assess the performance of participating nursing homes based on quality measures in four domains: nurse staffing, avoidable hospitalizations, resident outcomes based on the minimum data set, and survey deficiencies from State health inspection surveys. This report addresses the approach that CMS will use to risk adjust the nurse staffing level measures.

The nurse staffing domain was included in the NHVBP demonstration because of the relationship between nursing home staffing levels, staffing stability, and resident outcomes. As noted in the NHVBP Design Refinements report (March 2009), low staffing levels place residents at increased risk of hospitalizations and poor quality outcomes, while higher staffing levels are associated with fewer hospitalizations and better quality outcomes.

The staffing domain includes four measures. Three of these are staffing level measures: registered nurse and director of nursing (RN+DON) hours per resident day, licensed staff¹ hours per resident day, and certified nursing assistant (CNA) hours per resident day. The fourth is a composite nursing staff turnover measure. Because residents have different care needs, nursing homes with the same staffing levels could differ substantially in how well their staffing levels meet these needs. Thus, reported staffing levels must be adjusted to reflect the care needs (i.e., patient acuity or frailty) of a facility's residents.

To calculate staffing levels, CMS uses payroll, resident census and agency staff data submitted by the participating nursing homes each quarter. The use of payroll data is an important part of ensuring that accurate staffing data is used for the demonstration. Staffing levels are calculated by dividing total productive hours reported from payroll and agency staff data by total resident days. Note that agency staff hours are only included at 80 percent of their reported value.

¹ Licensed staff includes DONs, RNs, and licensed practical nurses (LPNs).

Risk Adjustment Methodology

The risk adjustment approach is based on the distribution of a facility's residents by Resource Utilization Group (RUG)-III category. The risk adjuster uses the 53-group RUG-III model² and the average minutes by RUG-III category from the CMS Staff Time and Resource Intensity Verification (STRIVE) study. We apply the risk adjuster to the payroll/agency data reported by the nursing homes participating in the demonstration.

The basic steps in the calculation of risk adjusted staffing levels for each nursing home are as follows:

Determine distribution of residents by RUG-III category: A nursing home's distribution of residents by RUG-III category is based on a summary of minimum data set (MDS) information for residents of the nursing home. The MDS assessments for each active nursing home resident³ are consolidated to create a profile of the most recent standard information for the resident (within the period, i.e., the demonstration year). This information can represent a composite of items taken from the most recent comprehensive, full, quarterly, prospective payment system (PPS), and admission MDS assessments, with different items potentially coming from different assessments. The intention is to create a profile with the most recent standard information for an active resident, regardless of source of information. These data are used to place each resident in a RUG category.

For example, the data file that we used for the base period risk adjuster was based on a "draw" of the most recent RUG category distribution data for participating nursing homes on the last business day for March 2009 (the last month of quarter one of 2009). This provided information on the distribution of residents by RUG-III group for the baseline period covered by our payroll data (i.e., January through March, 2009). Note that we will use the 53-group RUG-III model to risk adjust staffing levels throughout the entire baseline and 3-year demonstration period.

Calculate expected nursing hours: Expected nurse hours are calculated based on the average nurse minutes for each RUG-III category for each nurse type (RNs, LPNs, and nurse aides) from the CMS STRIVE staffing study (Table 1). For each nursing home, the minutes in each category are multiplied by the number of residents in each RUG category during the period, yielding total hours for each RUG category. These totals are summed

² As of October 1, 2010, Medicare SNF PPS payments are based on RUG-IV. However, in addition to RUG-IV, CMS will continue categorizing nursing home residents using RUG-III groupings because some States still base their nursing home Medicaid payments on RUG-III.

³ An active resident is defined as a resident who, on the last day of the quarter, has no discharge assessment and whose most recent MDS transaction is less than 180 days old. This allows for 93 days between quarterly assessments, 14 days for completion, 31 days for submission after completion, and about one month grace period for late assessments.

over all RUG categories, and then the sum is divided by the total number of nursing home residents during the period. This yields the “expected” number of nurse hours for the nursing home, by nurse type. Later in this paper is an example showing how expected hours are calculated.

**Table 1
Nurse Minutes by RUG-III Group Based on CMS STRIVE
Study**

| RUG-III Group | RN Minutes | LPN Minutes | CNA Minutes | Total Licensed Minutes |
|----------------------|-----------------------|------------------------|------------------------|---------------------------------------|
| RUX | 30.40 | 102.44 | 155.80 | 132.84 |
| RUL | 46.62 | 71.72 | 96.52 | 118.34 |
| RVX | 41.81 | 51.35 | 152.58 | 93.16 |
| RVL | 68.46 | 69.05 | 112.05 | 137.52 |
| RHX | 56.59 | 51.39 | 132.23 | 107.98 |
| RHL | 36.45 | 63.00 | 78.00 | 99.45 |
| RMX | 72.71 | 78.13 | 136.49 | 150.84 |
| RML | 42.31 | 58.61 | 123.09 | 100.92 |
| RLX | 142.61 | 47.02 | 256.88 | 189.63 |
| RUC | 45.03 | 68.89 | 163.52 | 113.92 |
| RUB | 37.43 | 57.95 | 106.38 | 95.38 |
| RUA | 65.24 | 51.56 | 67.10 | 116.80 |
| RVC | 33.25 | 69.06 | 156.77 | 102.30 |
| RVB | 24.95 | 46.57 | 102.59 | 71.52 |
| RVA | 23.22 | 54.71 | 48.45 | 77.94 |
| RHC | 37.87 | 71.11 | 151.48 | 108.97 |
| RHB | 21.73 | 60.99 | 97.50 | 82.73 |
| RHA | 37.12 | 51.24 | 77.44 | 88.36 |
| RMC | 20.47 | 59.45 | 158.57 | 79.92 |
| RMB | 18.77 | 56.73 | 109.17 | 75.50 |
| RMA | 21.10 | 29.83 | 55.88 | 50.92 |
| RLB | 12.97 | 46.36 | 196.67 | 59.33 |
| RLA | 25.62 | 40.90 | 98.41 | 66.52 |
| SE3 | 45.36 | 66.81 | 130.70 | 112.18 |
| SE2 | 30.79 | 62.50 | 132.41 | 93.30 |
| SE1 | 29.46 | 49.93 | 101.57 | 79.39 |
| SSC | 17.55 | 64.98 | 141.77 | 82.53 |
| SSB | 28.19 | 52.10 | 121.71 | 80.29 |
| SSA | 25.46 | 49.01 | 91.59 | 74.46 |
| CC2 | 25.38 | 65.49 | 177.78 | 90.87 |
| CC1 | 19.94 | 38.99 | 144.17 | 58.93 |
| CB2 | 17.08 | 41.83 | 152.73 | 58.91 |
| CB1 | 13.92 | 43.95 | 134.47 | 57.86 |
| CA2 | 30.18 | 55.65 | 89.20 | 85.83 |
| CA1 | 14.60 | 36.31 | 61.62 | 50.90 |
| IB2 | 5.07 | 26.06 | 106.29 | 31.12 |
| IB1 | 9.11 | 30.54 | 90.78 | 39.65 |
| IA2 | 6.55 | 21.60 | 46.08 | 28.16 |

| Table 1 Nurse Minutes by RUG-III Group Based on CMS STRIVE Study | | | | |
|---|-------------------|--------------------|--------------------|-------------------------------|
| RUG-III Group | RN Minutes | LPN Minutes | CNA Minutes | Total Licensed Minutes |
| IA1 | 8.02 | 26.16 | 45.14 | 34.18 |
| BB2 | 11.56 | 24.09 | 57.48 | 35.65 |
| BB1 | 1.69 | 37.68 | 43.61 | 39.37 |
| BA2 | 0.00 | 39.67 | 27.11 | 39.67 |
| BA1 | 9.43 | 33.60 | 29.19 | 43.03 |
| PE2 | 9.56 | 35.67 | 172.01 | 45.23 |
| PE1 | 14.28 | 31.17 | 152.26 | 45.45 |
| PD2 | 7.03 | 31.01 | 125.92 | 38.04 |
| PD1 | 13.33 | 30.16 | 115.59 | 43.49 |
| PC2 | 15.11 | 26.52 | 109.93 | 41.63 |
| PC1 | 7.14 | 22.62 | 74.39 | 29.76 |
| PB2 | 7.24 | 25.08 | 46.17 | 32.32 |
| PB1 | 14.11 | 17.61 | 55.53 | 31.72 |
| PA2 | 1.98 | 26.96 | 26.45 | 28.94 |
| PA1 | 8.06 | 27.83 | 31.98 | 35.89 |
| Note: Minutes include resident-specific and non-resident specific minutes, with non-resident minutes allocated in proportion to the amount of resident-specific time the resident received. | | | | |

Calculate risk adjusted staffing levels: Risk adjusted measures of hours per resident day are calculated for each nursing home for each staff type using this formula:

$$\text{Hours}_{\text{Adjusted}} = (\text{Hours}_{\text{Reported}} / \text{Hours}_{\text{Expected}}) * \text{Hours}_{\text{State Average}} * \text{Adjustment Factor}$$

where $\text{Hours}_{\text{Reported}}$ are the nurse hours per resident day that each nursing home reports on their payroll data; $\text{Hours}_{\text{Expected}}$ are calculated as shown above; and $\text{Hours}_{\text{State Average}}$ are the mean across all demonstration facilities in a State of the reported hours per resident day. (These are determined for a given staff type for each year.) The State average hours represent the unadjusted mean of the reported hours across all demonstration participants in a State. Separate calculations of expected, reported, and average hours are made for each of the three performance measures based on staffing level.

The adjustment factor is used to ensure that mean risk adjusted hours in a State are equal to mean reported hours. It reflects differences between the average staffing levels for

demonstration participants and average expected minutes based on STRIVE. This factor is updated every year. For instance, for the demonstration participants in a given State and year, suppose that the average reported RN+DON hours per resident day are .60 and the average expected RN+DON hours per resident day are .50. Then the adjustment factor for that State that year would be $(.50/.60) = .83$.

Example: Application of Risk Adjustment Approach

To illustrate how the risk-adjustment approach works, consider a facility with ten residents, with this distribution by RUG-III group:

- 2 in RHC
- 3 in RMC
- 1 in SSB
- 1 in SE1
- 2 in CA2

Suppose that the nursing home’s **reported** RN+DON staffing level was 0.56 hours per resident day (based on payroll data and the resident census reported by the facility). This is calculated as total RN+DON productive hours divided by total resident days.

Assume that the average staffing level for demonstration nursing homes in the State is 0.5 RN+DON hours per resident day and that the adjustment factor in the State is 0.75.

- **Calculate expected staffing level:** The expected nursing RN staffing level for the nursing home is calculated by dividing expected total minutes (251.87) by the total number of residents at the facility (10). So the **expected** RN+DON staffing is 25.187 minutes or 0.42 hours per resident day.

| Example: Calculating Expected Total Minutes | | | |
|--|-----------------------|----------------------------|-------------------------------|
| RUG-III category | STRIVE minutes | Number of Residents | Expected Total Minutes |
| RHC | 37.87 | 2 | 75.74 |
| RMC | 20.47 | 3 | 61.41 |
| SSB | 28.19 | 2 | 56.38 |
| SE1 | 29.46 | 1 | 29.46 |
| CA1 | 14.6 | 1 | 14.6 |
| PE1 | 14.28 | 1 | 14.28 |
| Total | | 10 | 251.87 |
| <i>Average</i> | | | <i>25.187</i> |

- Calculate risk-adjusted staffing level:** Risk adjusted RN staffing for the facility is calculated using the formula above: $\text{Hours}_{\text{Adjusted}} = (\text{Hours}_{\text{Reported}} / \text{Hours}_{\text{Expected}}) * \text{Hours}_{\text{State Average}} * \text{Adjustment Factor}$. Using data from our example, the risk-adjusted staffing level is calculated as $(0.56/0.42) * 0.5 * 0.75 = 0.5$. Note that this facility has an above-average case-mix (with 8 of their 10 residents in the Rehabilitation (RHC, RMC), Extensive Services (SE1) or Special Care (SSB) category). As a result, the risk-adjusted staffing RN staffing level for the facility is *less* than the reported level. This is because, given the nursing home's case-mix, which reflects the underlying care needs of its residents, the facility would be expected to have above average RN and DON staffing.

Table 2 includes the baseline State averages for reported and expected staffing levels, as well as the baseline State adjustment factors.

| Table 2 State Averages for Baseline Period | | | |
|--|----------------|-----------------|------------------|
| Measure | Arizona | New York | Wisconsin |
| Reported RN and DON hours/resident day | 0.465 | 0.555 | 0.664 |
| Reported licensed hours/resident day | 1.330 | 1.357 | 1.197 |
| Reported CNA hours/resident day | 2.167 | 2.246 | 2.352 |
| Expected RN and DON hours/resident day | 0.367 | 0.350 | 0.359 |
| Expected licensed hours/resident day | 1.098 | 1.096 | 1.091 |
| Expected CNA hours/resident day | 1.780 | 1.906 | 1.849 |
| Adjustment factor: RN and DON | 0.767 | 0.627 | 0.536 |
| Adjustment factor: Licensed | 0.818 | 0.797 | 0.908 |
| Adjustment factor: CNA | 0.813 | 0.845 | 0.784 |
| Note that the State adjustment factor is set to ensure that risk-adjusted staffing levels are equal to the reported staffing levels for each State. It is calculated by dividing reported staffing levels by risk-adjusted staffing levels without an adjustment factor applied. | | | |

Conclusion

This document describes the risk-adjustment approach used for the staffing level performance measures used in the NHVBP demonstration. NHVBP includes three staffing-related performance measures: RN+DON hours per resident day, licensed staff hours per resident day, and CNA hours per resident day. Performance on these measures is assessed using risk-adjusted staffing levels, with a risk-adjustment approach that considers the distribution of the facility's residents by RUG-III group and expected staffing levels from the STRIVE study. This approach was applied to calculate the baseline case-mix adjusted staffing levels that were sent to demonstration participants in January 2011, and it will be used to calculate the risk-adjusted staffing level measures for the 3 performance years of the demonstration.