Community Discharge and Rehospitalization Outcome Measures (Fiscal Year 2011)

A report by staff from Providigm, LLC, for the Medicare Payment Advisory Commission

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Final Report

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Table of Contents

Tables and Figures

1.0 INTRODUCTION

In March 2012, the Medicare Payment Advisory Commission (MedPAC) recommended to the Congress that payments should be reduced for SNFs with relatively high rates of readmission to hospitals. The recommendation states that the readmission measure initially should include readmissions that occur during Medicare-covered stays, and be expanded to include a time period after discharge from the SNF once a risk adjustment method has been developed. The Commission noted that expanding the readmission measure beyond the SNF stay would help ensure effective transitions between the SNF and the home or the next post-acute care provider, and it would put hospitals and SNFs at similar risk for readmissions that occur within a defined period after the beneficiary is discharged from their immediate care. A major purpose of this study is to develop the methodology for calculating this new 30 days post-SNF discharge readmission measure.

In addition to developing this new measure, a major objective of this study is to develop a new methodology for calculating the risk-adjusted quality measures currently reported by MedPAC. The Commission has tracked two quality measures for skilled nursing facilities: risk-adjusted rates of readmission to hospital for potentially avoidable conditions (respiratory infections, heart failure, electrolyte imbalance, urinary tract infections, and sepsis), and discharge to the community. Current MedPAC methodology uses data extracted from the DataPro file, which was constructed by CMS using hospital and SNF claims merged with patient assessment information from the MDS 2.0. The future availability of the DataPro file is in question. In addition, the MDS 3.0 represents an improvement on the MDS 2.0 with respect to tracking stays and data quality such that MDS 3.0 may prove to be more useful for calculating these SNF quality measures.

Moreover, analyses based on the DataPro file lagged more than a year behind the source files such that in 2012 MedPAC was reporting rates of SNF quality measures for 2009. With the use of selected claims data from the source files and development of comparable or improved risk adjustment models using MDS 3.0 data, the SNF quality measures could be more current. This would allow the quality measures to cover the same time period as the cost and payment information the Commission evaluates each year in assessing the adequacy of payments. Thus, a second objective is to rigorously develop risk-adjusted SNF stay quality measures based on fiscal year 2011 data utilizing the MDS 3.0 data set. As part of this development, risk-adjusted measures of all cause readmission from SNF in the 30 days following hospital discharge will be studied because of the emphasis on hospital readmissions during this post-hospital period in the Hospital Readmission Reduction Act.

Finally, to further the Commission's work comparing dual- and non-dual-eligible beneficiaries, another objective of this study is to compare SNF case mix and outcomes for these two groups of beneficiaries. The Commission has particular interest in the dual-eligible population. In June 2010, it compared the Medicare and Medicaid spending for various subgroups of dual-eligible beneficiaries, including those who were high users of nursing home services. Little is known, however, about the subgroup of dual-eligible beneficiaries who receive SNF care.

2.0 METHODS

2.1 SNF Quality Measure Definitions

A total of eight SNF quality measures were calculated using FY 2011 data. These included four Medicare SNF stay measures, two post-SNF discharge measures, and two combined stay and post-SNF discharge measures. The first two of these measures were defined the same as they were in prior MedPAC reports. For each measure, a raw rate was calculated for all included residents, then an observed facility rate was calculated for eligible facilities, and finally a risk-adjusted facility rate was calculated for all eligible facilities. The eight measure definitions were:

- **Community Discharge (at 100 Days)**: Rate of community discharge during Medicare SNF stay within 100 days of admission for eligible facilities. Community discharge was defined as direct discharge from the SNF to home, with or without home care, in contrast to long-term nursing home care in the same or a different facility.
- **Readmission Rate Five Potentially Avoidable Conditions (at 100 Days)**: Rate of rehospitalization for any of five potentially avoidable conditions during Medicare SNF stay within 100 days of admission for eligible facilities. Rehospitalization was defined as an admission to an acute care or critical access hospital. Potentially avoidable rehospitalization measures were defined as hospitalizations occurring from the SNF for heart failure, electrolyte imbalance, respiratory infection, sepsis, or UTI based on the readmission hospital primary or secondary diagnoses.
- **100-Day All-Cause Readmission Rate**: Rate of rehospitalization for any condition during Medicare SNF stay within 100 days of admission for eligible facilities.
- **30-Day All-Cause Readmission Rate**: Rate of rehospitalization for any condition during Medicare SNF stay within 30 days of admission for eligible facilities.
- **Post-SNF Readmission Rate Five Potentially Avoidable Conditions:** Rate of rehospitalization for any of five potentially avoidable conditions during the 30 days post-SNF discharge for eligible facilities.
- **Post-SNF Readmission Rate All Causes:** Rate of rehospitalization for any condition during the 30 days post SNF discharge for eligible facilities.
- **Combined Readmission Rate Five Potentially Avoidable Conditions:** Rate of rehospitalization for any of five potentially avoidable conditions during the SNF stay or 30 days post-SNF discharge for eligible facilities.
- **Combined Readmission Rate All Causes:** Rate of rehospitalization for any condition during the SNF stay or 30 days post-SNF discharge for eligible facilities.

2.2 Quality Measurement Development

Observed rates corresponding to each measure were calculated for each facility as a ratio of the number of Medicare beneficiaries for whom the outcome occurred (e.g. readmission for potentially avoidable condition in 100 days) divided by the number of included Medicare stays for the facility during the study period. Observed rates, however, do not take into consideration differences in risk of readmission (or probability of readmission). These risks or probabilities vary considerably among Medicare admissions and in aggregate among facilities. Thus, risk-adjusted rates were required to compare facilities and equate facilities when averaging rates for each study outcome.

The risk-adjusted rate for each facility was calculated by first determining an expected rate of the outcome measures based on the probability that each resident will experience the outcome. For the post-discharge measures, the probability of readmission and beneficiary characteristics differed so significantly by the setting to which the SNF beneficiary was discharged that a separate model was estimated for each discharge location (long-term nursing home, home with home health care, home without home health care). To determine the post-SNF discharge location, claims for Medicare SNF and home health stays were merged into the MDS assessment sequence. SNF discharges to long-term nursing home care were nursing home stays that exceeded the SNF stay; SNF discharges to home health care were those in which home health claims were found within 30 days of SNF discharge; and SNF discharges to home without home health care included the remaining live discharges. Logistic regression models were estimated for each outcome and location at the stay level using beneficiary characteristics. Based on the model, the expected readmission rate was then calculated for each eligible facility by summing the probabilities that each resident would experience the outcome of interest.

The expected rate for the facility was the sum of estimated readmission probabilities for all SNF discharges from that facility across all locations. For the two combined outcome measures, probabilities of readmission for the beneficiary were summed for the stay SNF stay and post SNF discharge. The facility risk-adjusted rate was calculated based on the observed rate of outcome events divided by the expected rate of outcome events multiplied by the national average of the observed rate for FY 2011. Thus, an observed and risk-adjusted rate was calculated for each measure for which a facility was eligible.

2.3 Resident-level Independent Variables

2.3.1 Comorbidity indices

Items from MDS 3.0 Section I (Active Diagnoses) were used for constructing a set of conditions that were then used as binary covariates in a logistic regression model for estimating comorbidity indices for each of the outcome measures. For each of the four SNF stay outcome measures, comorbidity indices were estimated using all stays. For the two post SNF discharge outcome measures, a separate comorbidity index was estimated for each location due to case mix differences among locations yielding six separate comorbidity indices for this measure. All items in Section I (both the I0100 – I6500 active diagnoses list as well as individual ICD-9 diagnoses codes, I8000A-I8000J) were evaluated using Spearman correlation and selected items were then used to construct 24 binary condition indicators. All 24 conditions were used for each comorbidity index even though for a particular index not all of the covariates were statistically significant. Outcome-specific weights were calculated for each condition indicator using a logistic regression approach. For each stay, the appropriate comorbidity index was included as a covariate in the risk adjustment models.

2.3.2 Other Covariates

MDS resident characteristics such as functional status and health conditions that were objective and not optional nursing home staff services were tested for inclusion in models in a series of step-wise regressions. All MDS 3.0 treatment items such as indwelling catheter use were excluded from consideration. Some items such as advanced directives and cognitive performance scale that had been useful in past risk adjustment models were not available on the

MDS 3.0 so were not included in the risk models. However, cognitive status was adjusted for using the comorbidity index. In addition to the comorbidity index, a functional index was calculated for each resident as in past MedPAC analyses based upon the Barthel Index. The Modified Barthel Index was a weighted sum of dependence in bathing, dressing, grooming, toileting, transferring, eating, urinary incontinence, bowel incontinence, and ambulation (ranging from 0-90 rather than 100 because use of stairs is not generally assessed in SNFs.

Potential covariates were screened for each outcome using Spearman correlation at the stay level. Those with a significant correlation were chosen as candidates for the models. Because of the large number of stays used in modeling, resulting in pervasive statistical significance of potential covariates, covariates were selected for inclusion in the final model using both an increase in the model fit (c-index) and statistical significance (p-value).

2.4 Resident Exclusions and Facility Eligibility

Residents enrolled in Managed Care Organizations (MCO) at any time during the study period were excluded because these residents would not have any inpatient and other claims data. SNF stay measures excluded residents who died in the SNF before 100 days. The only exception was when a rehospitalization and death occurred on or within one day of the SNF discharge, the stay and readmission was "added back." These readmissions were considered to be attributable to the SNF because the discharge occurred at time of death, and thus SNFs that avoided such terminal readmissions were considered to provide higher-quality care. Beyond the first day, however, a conservative approach was taken because if death occurred in the hospital it was not clear whether the readmission was an appropriate attempt at life-saving care or an inappropriate readmission for a terminal condition. With more complete data on end of life care, advanced directives, and hospice status than available on MDS and claims, readmissions associated with deaths could be more fully understood.

Stays with a readmission during the SNF stay were then excluded from the post SNF discharge measure because a readmission had already occurred for that stay. For the two 30 day post-SNF discharge outcome measures, all stays in which the resident died either during the SNF stay or within 30 days of the SNF discharge were excluded. Once again, accurate information on end of life care and advanced directives would have enabled inclusion of residents that were or were not readmitted during this period, but without such information the more conservative approach of excluding deaths was decided upon.

Facility eligibility required minimum sample sizes to ensure stable estimates for each facility, as in prior MedPAC rate calculations. Due to the changes since 2004, when minimum sample size estimates were conducted, the stay measure minimum was reassessed based on the balance between stability and number of facilities excluded by various sample sizes. For the post SNF discharge measures that had a different calculated rate on average as well as fewer potential facilities due to exclusions, these competing priorities were evaluated. The methods and results of these analyses are detailed in Appendix A.

2.5 Data and Data Sources

Component data files and extracts for the project were provided by the Medicare Payment Advisory Commission (MedPAC) contractors (Acumen and Social & Scientific Systems) and were from the following five sources:

- Centers for Medicare & Medicaid (CMS) claims extract files
- Minimum Data Set (MDS) 3.0 Assessment files

- Dual-eligibility extract indicator file: A dual-eligibility indicator was constructed using monthly binary indicators. If a resident indicated dual eligibility at any time during the study period all stays for that resident were classified as dual eligible.
- Enrollment file with Managed Care Organization (MCO) extract indicator
- Provider of Service (POS) facility extract file

The claims data, which included only selected fields (e.g. resident identification number, facility identification number, stay dates, and diagnoses codes), were provided only for those individuals who had SNF stays from 9/1/2010 to 12/31/2011, and included any Inpatient, SNF, and Home Health stays for these beneficiaries. The MDS file included all available fields for the period 10/1/2010 to 12/31/2011 for all nursing home residents. The dual eligibility file contained binary indicators by month and a resident identification number for matching. The enrollment file contained death indicators and MCO indicators by month only for SNF stays as well as a resident identifier for matching. The POS file was for all providers and had a selected set of modified fields (e.g., name, ownership, staffing count). A series of screens (e.g. study period admission date) and exclusions (e.g., internal stay or death date conflicts) were applied during the analytic file construction.

The stay-level file that had 1,948,396 stays was constructed after merging all the component files together and applying data exclusions. All analyses used the following two analytic files based on the exclusions previously described: The SNF Stay Analytic File had 1,867,190 stays, and the Post-SNF Discharge Analytic File had 1,331,777 stays.

2.6 Dual Eligible Regression Analysis

At the resident level, dual eligible beneficiaries were compared to non-dual eligible beneficiaries using standard statistical procedures. To assess whether the measures of readmission during the Medicare stay and community discharge during the Medicare stay differed between dual eligible and non-dual eligible beneficiaries, the estimated resident-level risk models were utilized and then the dual eligibility variable was forced into the model. The magnitude and significance of the dual eligible coefficient provided an estimate of the effect of being dual eligible after controlling for beneficiary case mix.

2.7 Facility-Level Regression Analysis

Facility characteristics associated with the facility-level, risk-adjusted measures of potentially avoidable readmission during the Medicare stay, post SNF stay, and community discharge were further analyzed using multivariable regression. Covariates included facility characteristics of hospital-based vs. freestanding, ownership with non-profit as the referent, urban vs. rural, and less than 50 certified beds. Other bed-size splits were analyzed but were not associated with any of the quality measures. Therapy full-time positions per bed were included (hours were not available) to analyze the relationship to risk-adjusted community discharge rates. Indicators for the state in which each facility was located were included to determine the variation that occurred by state. The greatest state outlier was the referent for each measure so the coefficients would all be positive for ease of comparison.

3.0 RESULTS

3.1 Stay-Level Results

3.1.1 Stay-Level Outcomes and Characteristics for Dual-Eligible and Non-Dual-Eligible Beneficiary Stays

A total of 1,867,190 SNF stays with SNF admission dates from 10/1/2010 to 9/30/2011 were included in the analysis. These stays excluded the 4.2% of stays that ended in deaths as in past MedPAC rate calculations due to the unique characteristics and mix of planned and unanticipated death without a means of making such a distinction. Of these remaining stays, over one-third were for SNF patients who were dually eligible for Medicare and Medicaid (TABLE 1A).

Dual-eligible beneficiaries were about half as likely to be discharged to the community within 100 days of SNF admission relative to non-dual eligible beneficiaries, even after adjusting for case-mix differences (22.5% vs. 41.5%). This difference indicated that Medicare SNF patients who were also covered by Medicaid were more likely to remain in the nursing home at the end of their Medicare stay, probably becoming long-stay residents of nursing homes.

Raw differences in rates of readmission to hospital between dual-eligible and non-dual eligible Medicare beneficiaries at 100 days for potentially avoidable conditions and all conditions, were explained almost entirely by case-mix differences. Thus, being dual eligible per se did not appreciably increase or decrease risk of readmission at 100 days. At 30 days, dual-eligible beneficiaries were 2.1 percentage points less likely to be readmitted (13.8% vs. 15.9%) for any cause even after controlling for demographics, function, cognition, and comorbidities.

Relative to non-dual eligible, dual-eligible SNF beneficiaries were more likely to be less than 65 years of age (18.8% vs. 3.7%), were more likely to be unmarried (80.4% vs. 60.8%), and be more functionally impaired (e.g. Barthel Index 33.8 vs. 40.7) (TABLE 1B). Diabetes Mellitus, Chronic Lung Disease, Stroke, Dementia, and Depression were all substantially more prevalent comorbid diseases in dual-eligible than non-dual eligible beneficiaries (TABLE 1C). While these case-mix differences are consistent with what is known about the frail, dual-eligible population, SNFs treating substantial numbers of dual-eligible beneficiaries face greater challenges.

The lower raw rate of community discharge and the higher raw readmission rates could hypothetically result from these case mix differences. However, differences in the rates of community discharge in 100 days and readmission in 30 days persisted even after risk adjustment, suggesting that factors other than case mix affect the outcomes of dual eligible SNF beneficiaries. The lower community discharge rate among dual eligible beneficiaries could be in part due to case mix characteristics that were not measured in MDS, such as the extent of social supports available to dual eligible beneficiaries. Alternatively, exogenous factors such as Medicaid payment policies that offer greater coverage of nursing home care in contrast to community-based care could reduce community discharge options.

TABLE 1A: SNF Stay-Level Outcomes for All Beneficiary, Dual-Eligible, and Non-Dual-Eligible Stays (Fiscal Year 2011)

	All Beneficiary Stays[1]	Dual-Eligible Stays	Non-Dual-Eligible Stays
Population			
Number of SNF stays	1,867,190	694,218	1,172,972
Percent of All Stays	100.0%	37.2%	62.8%
Outcome Measures			
Community Discharge Rates			
During SNF Stay at 100 Days			
Raw	39.5%	21.8%	49.9%
Case-Mix Adjusted		22.5%	41.5%
Readmission Rates			
During SNF Stay at 100 Days			
Potentially Avoidable Conditions			
Raw	19.7%	22.7%	17.9%
Case-Mix Adjusted		14.2%	15.0%
All-Cause			
Raw	24.4%	28.3%	22.2%
Case-Mix Adjusted		19.4%	19.8%
During SNF Stay at 30 Days			
All-Cause			
Raw	19.4%	21.2%	18.3%
Case-Mix Adjusted		13.8%	15.9%
Location at End of SNF Stay			
Hospital, Direct Readmission	24.4%	28.2%	22.2%
Nursing Home	24.2%	40.8%	14.3%
Community with Home Health	32.9%	19.4%	40.9%
Community without Home Health	18.5%	11.6%	22.6%

[1] Excludes all deaths during SNF stay unless readmission on or within 1 day of SNF discharge (N=81,206, 4.2%).

TABLE 1B: Resident Demographics and Characteristics for All Beneficiary, Dual-Eligible, and Non-Dual-Eligible Stays (Fiscal Year 2011)

	All Beneficiary Stays[1]	Dual-Eligible Stays	Non-Dual-Eligible Stays
Demographics			
Female	63.0%	64.9%	61.9%
Age at End of First SNF Stay (Years)	79.5	76.0	81.5
Age, Less Than 65 Years	9.3%	18.8%	3.7%
Age, 65 to Less Than 75 Years	20.2%	22.7%	18.8%
Age, 75 to Less Than 85 Years	35.3%	30.2%	38.3%
Age, 85 Years or Greater	35.2%	28.3%	39.2%
Never Married	11.1%	18.9%	6.6%
Married	32.0%	19.6%	39.2%
Widowed	45.1%	42.5%	46.7%
Separated	1.2%	2.1%	0.6%
Divorced	10.6%	16.9%	6.9%
Race/Ethnicity: White	84.5%	71.6%	92.2%
Race/Ethnicity: African American	10.1%	17.7%	5.6%
Race/Ethnicity: Hispanic	3.7%	7.7%	1.4%
Race/Ethnicity: Other	1.7%	3.0%	0.9%
Characteristics During SNF Stay			
Average Modified Barthel Index (0 to 90; higher more independent)	38.1	33.8	40.7
Acute Onset Mental Status Change	6.2%	7.8%	5.3%
Uses Walker	62.3%	48.0%	70.8%
Shortness of Breath When Sitting at Rest	10.8%	13.1%	9.5%
Fever	6.2%	7.7%	5.4%
Falls Since Admission or Prior Assessment	18.5%	23.2%	15.6%
Average # of Stage 2 Pressure Ulcers at Admission	0.092	0.104	0.085
Surgical Wounds	28.9%	21.2%	33.5%
Average # of Days Physician Orders Changed in Last 14 Days	3.6	3.3	3.7

[1] Excludes all deaths during SNF stay unless readmission on or within 1 day of SNF discharge (N=81,206, 4.2%).

TABLE 1C: Resident Comorbid Diseases for All Beneficiary, Dual Eligible, and Non-Dual Eligible Stays (Fiscal Year 2011)

Comorbid Diseases	All Beneficiaries Stays[1]	Dual-Eligible Stays	Non-Dual-Eligible Stays
Cancer	6.2%	4.9%	6.9%
Anemia	35.4%	38.5%	33.5%
Dysrhythmia	16.9%	13.4%	19.0%
Coronary Artery Disease (CAD)	18.6%	17.2%	19.4%
Heart Failure (CHF)	26.3%	29.1%	24.6%
Hypertension	78.4%	79.4%	77.8%
Peripheral Vascular Disease	5.8%	6.5%	5.3%
Cirrhosis	0.5%	0.7%	0.4%
Gastro Esophageal Reflux Disease	21.0%	21.9%	20.5%
End Stage Renal Disease	10.5%	11.1%	10.1%
Pneumonia	14.0%	15.7%	13.0%
Septicemia	2.7%	3.3%	2.2%
Diabetes Mellitus (DM)	35.8%	43.8%	31.0%
Thyroid	14.1%	12.5%	15.1%
Arthritis	19.4%	17.4%	20.6%
Osteoporosis	9.5%	8.3%	10.2%
Hip Fracture	8.1%	6.2%	9.2%
Other Fracture	9.5%	7.4%	10.7%
Alzheimer's Disease	6.6%	9.2%	5.1%
Stroke (CVA or TIA or Stroke)	14.7%	18.5%	12.5%
Dementia	25.4%	32.7%	21.1%
Hemiplegia	5.3%	7.6%	3.9%
Paraplegia	0.5%	1.0%	0.3%
Traumatic Brain Injury (TBI)	0.6%	0.7%	0.5%
Malnutrition	4.3%	4.9%	4.0%
Depression	37.7%	46.1%	32.7%
Psychotic	5.1%	9.2%	2.8%
Schizophrenia	2.3%	5.4%	0.5%
Asthma, COPD, Chronic Lung Disease	27.9%	32.9%	24.9%
Respiratory Failure	3.2%	4.3%	2.5%
Cataracts or Glaucoma	6.9%	6.4%	7.1%

[1] Excludes all deaths during SNF stay unless readmission on or within 1 day of SNF discharge (N=81,206, 4.2%).

3.1.2 Stay-Level Outcomes and Characteristics Post-SNF Discharge

Discharges from SNFs may stay long term in the same facility to which they were admitted, be discharged to a different long-term nursing facility, or be discharged to various community settings (e.g. private residence, community independent living with selected available services such as communal meals, assisted living that also provides personal care) with or without Medicare Home Health Care. As described in the methods section, stratifying by discharge location was essential in order to both study and risk adjust post SNF discharge measures. The different post SNF discharge locations admitted different subgroups of SNF discharges, and also offered different services that raise or lower the risk of rehospitalization.

A particularly challenging issue that needed to be addressed with respect to post SNF discharge readmissions related to how to deal with beneficiaries who died in the 30 days post SNF discharge. Accurately identifying SNF discharges receiving end of life care was not possible because many SNF discharges receive palliative care in long-term nursing homes, at home, or other living situations without hospice services. Thus, it was not possible to accurately distinguish planned from unintended post SNF discharge deaths. Given that it was not possible to identify appropriate hospital readmissions surrounding deaths in any post SNF discharge location, beneficiaries who died during the 30 days after discharge were excluded from the post SNF discharge measures, just as deaths during SNF stays were excluded from the stay-level analysis.

TABLE 2A: Stay-Level Outcomes for 30 Days Post-SNF Discharge Stays by Location (Fiscal Year 2011)

		30 Days Post SNF Discharge Location		
Population	SNF Discharge Stays[1]	Nursing Home (Long-Term)	Home Health	Community or Other
Number of SNF Stays	1,331,777	407,546	603,497	320,734
Percent of All Stays	100.0%	30.6%	45.3%	24.1%
Outcome Measures				
All-Cause Readmission	12.7%	11.4%	12.8%	14.0%
Potentially Avoidable Readmission	9.3%	8.8%	9.4%	9.8%

[1] Excludes all deaths during SNF Stay and 30 days post SNF discharge (N=79,125, 4.2%) and all readmissions during the SNF stay (N=456,288, 24.4%).

Mortality rates for those beneficiaries discharged from SNFs were: 9.8% for long-stay nursing home residents, 1.7 % for discharges to community with home health care, and 7.2% for discharges to community without home health care: average of 5.6% for all SNF discharges. A total of 1,331,777 stays were available for fiscal year 2011following exclusions with the largest group discharged to home health care (45.3%), the next largest group discharged to non-Medicare nursing home care (30.6%), and the remainder returning to the community with either no Medicare services or other services such as Hospice care (24.1%). Observed readmission rates varied only minimally between discharge locations ranging from 11.4% to 14.0% for all-cause and 8.8% to 9.8% for potentially avoidable readmissions with the lowest unadjusted rates for those discharged to nursing homes and the highest for those discharged to the community (TABLE 2A).

The patients discharged to these three locations were distinct and disparate populations, as might be expected given the services and environment that each setting provided, so no attempt was made to compare readmission rates across the settings. Most compelling in this regard was the average Barthel Score (a comprehensive measure of activities of daily living where higher scores denote greater independence) with an average of 32.0 out of 90 possible points for SNF discharges to nursing home, 45.3 for SNF discharges to home health care, and 50.3 for SNF discharges to community or other setting without home health care (TABLE 2B). Discharges to nursing home were also characterized by substantially higher rates of age greater than 85 years, delirium, falls, fever, and shortness of breath at rest. Discharges to community with or without home health care were more likely to have post-operative wounds and be able to use a walker. Among striking comorbidity differences, SNF discharges to nursing home were much more likely to suffer from Alzheimer's Disease, Dementia, Hemiplegia, Stroke, Traumatic Brain Injury, Malnutrition, Depression and Psychosis (TABLE 2C). SNF discharges receiving home health care relative to those discharged to the community without home health care were characterized by higher rates of comorbidity such as cardiac diseases and hip fracture or other fractures, as well as being older and more likely to be female.

TABLE 2B: Resident Demographics and Characteristics for 30 Days Post SNF Discharge Stays by Location (Fiscal Year 2011)

	SNF Discharge Stays[1]	30 Days Post SNF Discharge Location		
		Nursing Home (Long-Term)	Home Health	Community or Other
Demographics				
Female	65.1%	65.1%	67.1%	61.5%
Age at End of First SNF Stay (Years)	79.4	80.5	79.6	77.6
Age, Less Than 65 Years	9.2%	10.0%	7.7%	11.1%
Age, 65 to Less Than 75 Years	20.6%	16.4%	20.9%	25.2%
Age, 75 to Less Than 85 Years	35.5%	31.9%	37.9%	35.4%
Age, 85 Years or Greater	34.7%	41.7%	33.5%	28.2%
Never Married	11.0%	14.4%	8.8%	10.7%
Married	31.8%	22.9%	35.0%	37.1%
Widowed	45.5%	49.7%	45.4%	40.4%
Separated	1.1%	1.4%	1.0%	1.1%
Divorced	10.6%	11.7%	9.7%	10.8%
Race/Ethnicity: White	85.6%	81.5%	86.9%	88.4%
Race/Ethnicity: African American	9.2%	12.1%	8.4%	6.9%
Race/Ethnicity: Hispanic	3.5%	4.5%	3.2%	3.0%
Race/Ethnicity: Other	1.7%	1.9%	1.4%	1.7%
Characteristics				
Average Barthel Index, 0(Bad) to 90(Good)	42.4	32.0	45.3	50.0
Acute Onset Mental Status Change	4.3%	8.7%	2.1%	2.6%
Uses Walker	68.7%	46.9%	80.3%	74.4%
Shortness of Breath When Sitting at Rest	7.5%	11.5%	5.7%	5.8%
Fever	4.6%	7.4%	3.3%	3.6%
Falls Since Admission or Prior Assessment	18.5%	35.1%	11.5%	10.6%
Ave. # of Stage 2 Pressure Ulcers at Admit	0.061	0.067	0.062	0.049
Surgical Wounds	31.8%	16.8%	38.5%	38.1%
Ave. # of Days Physician Orders Changed	3.5	2.8	3.9	3.6

[1] Excludes all deaths during SNF Stay and 30 days post SNF discharge (N=79,125, 4.2%) and all readmissions during the SNF stay (N=456,288, 24.4%).

TABLE 2C: Resident Comorbid Diseases for 30 Days Post SNF Discharge Stays by Location (Fiscal Year 2011)

Comorbid Diseases	SNF Discharge Stays[1]	30 Days Post SNF Discharge Location		
		Nursing Home (Long-Term)	Home Health	Community or Other
Cancer	5.9%	5.6%	6.2%	5.6%
Anemia	34.1%	39.1%	32.7%	30.5%
Dysrhythmia	17.6%	17.2%	18.8%	15.8%
Coronary Artery Disease (CAD)	19.7%	19.3%	20.8%	18.1%
Heart Failure (CHF)	23.6%	29.0%	21.9%	20.1%
Hypertension	78.6%	81.1%	78.5%	75.7%
Peripheral Vascular Disease	5.8%	6.9%	5.6%	4.7%
Cirrhosis	0.5%	0.5%	0.5%	0.6%
Gastro Esophageal Reflux Disease	23.0%	24.9%	22.8%	20.9%
End Stage Renal Disease	10.2%	11.1%	10.2%	9.1%
Pneumonia	12.3%	16.2%	10.5%	10.5%
Septicemia	2.2%	2.9%	1.9%	2.0%
Diabetes Mellitus (DM)	34.0%	37.0%	33.1%	31.8%
Thyroid	15.6%	16.1%	16.1%	14.1%
Arthritis	22.3%	21.3%	23.2%	21.7%
Osteoporosis	10.8%	12.1%	10.8%	9.3%
Hip Fracture	8.5%	8.0%	9.8%	6.6%
Other Fracture	10.1%	8.7%	11.5%	9.3%
Alzheimer's Disease	6.7%	14.2%	3.4%	3.5%
Stroke (CVA or TIA or Stroke)	14.1%	20.7%	11.7%	10.2%
Dementia	24.8%	45.4%	16.1%	15.1%
Hemiplegia	4.9%	8.6%	3.6%	2.9%
Paraplegia	0.5%	0.8%	0.3%	0.4%
Traumatic Brain Injury (TBI)	0.6%	0.8%	0.4%	0.5%
Malnutrition	3.8%	5.0%	3.3%	3.0%
Depression	37.8%	52.4%	31.7%	30.7%
Psychotic	5.1%	11.5%	2.2%	2.5%
Schizophrenia	2.3%	5.1%	0.9%	1.5%
Asthma, COPD, Chronic Lung Disease	26.3%	28.6%	25.3%	25.1%
Respiratory Failure	2.4%	3.0%	2.1%	2.0%
Cataracts or Glaucoma	7.7%	9.6%	7.2%	6.1%

[1] Excludes all deaths during SNF Stay and 30 days post SNF discharge (N=79,125, 4.2%) and all readmissions during the SNF stay (N=456,288, 24.4%).

3.1.3 Stay-Level Estimated Risk Models

The risk models for community discharge and readmission outcomes during the SNF stay utilized similar but not identical risk factors to those used in past risk adjustment models estimated for MedPAC (TABLE 3). Differences resulted from the exclusive use of MDS 3.0 data rather than the DataPRO file that contained both claims variables and MDS 2.0 data. While claims data were still necessary to provide dates for Medicare-covered stays, the improvements in MDS 3.0 relative to MDS 2.0 resulted in the ability to estimate models that were at least as predictive as previous models.

Models for probability of post SNF discharge stay-level outcomes were estimated for the first time in this study, and were sufficiently predictive of readmission to be used for risk adjustment purposes (c-index of 0.66 to 0.68 for potentially avoidable readmissions). Standardized information on characteristics in the post SNF discharge period is not available given that SNF discharges may receive care in different settings or not further post-acute care. However, the MDS 3.0 characteristics from during the SNF stay were almost as predictive for post-SNF discharge readmissions than they were for SNF stay readmissions.

The risk models were all dominated by the comorbidity indices (TABLE 4). Not surprisingly, the directionality (or sign) of the comorbidity coefficients were virtually always opposite for community discharge relative to readmission outcomes given that community discharge is a positive outcome and readmission is a negative outcome. The list of conditions was derived as in past MedPAC research; however, these comorbid diseases were encoded from the MDS 3.0 rather than claims variables as in past studies.

Other stay-level variables in the model were similar to those used in past MedPAC work representing areas such as functional status that are not available in comorbid diseases. The better comorbidity information related to cognitive impairment in MDS 3.0 in conjunction with functional status using the modified Barthel Index, seemed to adequately adjust for cognitive differences without the Cognitive Performance Score. Services provided by the nursing facility that reflected treatment decisions rather than case mix were excluded from the models. However, the average number of physician order changes, which is a proxy for medical instability and hence positively predictive of readmission to hospital, was included because physician order changes are not decided by the SNF. Race and dual-eligibility were not included in the final models because they did not contribute additional explanatory power to the clinical-based models.

TABLE 3: Risk Models for Stay-Level Outcomes for During SNF Stays and 30 Days Post SNF Discharge Stays

	Community Discharge and Readmission During SNF Stay				Readmission 30 Days Post SNF Discharge Stay					
	At 100 Days			At 30 Days	Potentially Avoidable Readmission From			All-Cause Readmission From		
Model Covariates	Community Discharge	Potentially Avoidable Readmit	All-Cause Readmit	All-Cause Readmit	Nursing Home	Home Health	Comm. or Other	Nursing Home	Home Health	Comm. or Other
Intercept	-1.583	0.198	0.259	0.390	-0.458	-0.064	0.159	-0.524	-0.188	-0.029
Comorbidity Index [1]	0.603	0.773	0.774	0.906	0.989	0.857	0.805	1.020	0.836	0.738
Average Modified Barthel Index	0.021	-0.028	-0.025	-0.024	-0.008	-0.010	-0.010	-0.003	-0.007	-0.008
Uses Walker	0.740	-0.295	-0.343	-0.329						
Shortness of Breath When Sitting at Rest	-0.690	0.730	0.650	0.563						
Fever		0.577	0.508	0.386						
Falls Since Admission or Prior Assessment	-0.590									
Surgical Wounds	0.529					-0.443	-0.672		-0.356	-0.607
Average # of Days Physician Orders Changed in Last 14 Days		0.100	0.095	0.078	0.1901	0.066		0.187	0.062	
Age Less Than 65 Years							0.303			0.423
c-index	0.76	0.75	0.73	0.73	0.66	0.67	0.68	0.64	0.63	0.65

[1] Comorbidity index model detail is provided in Table 4.

TABLE 4: Comorbidity Coefficients for Stay-Level Risk Models During SNF Stay and 30 Days Post SNF Discharge Stay

	Community Discharge and Readmission During SNF Stays				Readmission 30 Days Post SNF Discharge Stays					
	At 100 Days			At 30 Days	Potentially Avoidable Readmission From			All-Cause Readmission From		
Model Covariates	Community Discharge	Potentially Avoidable Readmit	All-Cause Readmit	All-Cause Readmit	Nursing Home	Home Health	Comm. or Other	Nursing Home	Home Health	Comm. or Other
Intercept	0.289	-1.646	-1.254	-1.355	-2.270	-2.781	-2.729	-1.847	-2.294	-2.179
Heart Failure	-0.482	0.554	0.338	0.333	0.375	0.585	0.619	0.158	0.314	0.320
Renal Insufficiency/Failure/Disease	-0.330	0.290	0.280	0.231	0.256	0.340	0.372	0.220	0.292	0.314
Diabetes Mellitus	-0.243	0.241	0.243	0.207	0.233	0.212	0.231	0.211	0.205	0.212
Arthritis, Rheumatologic Disease	0.330	-0.464	-0.471	-0.567	-0.255	-0.184	-0.307	-0.251	-0.170	-0.298
Asthma/COPD/Chronic Lung Disease	-0.214	0.192	0.173	0.175	0.228	0.261	0.312	0.218	0.246	0.288
Pneumonia	-0.324	0.339	0.243	0.210	0.148	0.212	0.219	0.051	0.134	0.124
Osteoporosis	0.097	-0.369	-0.389	-0.479	-0.286	-0.062	-0.060	-0.299	-0.072	-0.092
Cataracts/Glaucoma	0.017	-0.349	-0.369	-0.473	-0.361	-0.094	-0.125	-0.380	-0.104	-0.136
Gastro Esophageal Reflux Disease	0.116	-0.300	-0.307	-0.423	-0.192	-0.011	-0.038	-0.184	-0.003	-0.038
Hip Fracture/Other Fractures	0.215	-0.071	-0.042	-0.102	-0.181	-0.267	-0.240	-0.166	-0.253	-0.219
Dementia (without Alzheimer's)	-0.741	0.094	0.060	-0.019	-0.204	0.128	0.230	-0.256	0.092	0.167
Depression	-0.346	-0.042	-0.022	-0.104	-0.088	0.151	0.200	-0.076	0.173	0.239
Thyroid, Coagulopathy, Endocrine	0.072	-0.160	-0.166	-0.200	-0.138	-0.035	-0.042	-0.136	-0.042	-0.051
Cancer, with or without metastasis	-0.265	0.171	0.209	0.205	-0.020	0.221	0.129	0.002	0.239	0.130

Note: Grayed out estimates have p-values > .05 and are not statistically significant.

(Continued)

(Continued)

TABLE 4: Comorbidity Coefficients for Stay-Level Risk Models During SNF Stay and 30 Days Post SNF Discharge Stay

	Community Discharge and Readmission During SNF Stays				Readmission 30 Days Post SNF Discharge Stays					
	At 100 Days			At 30 Days	Potentially Avoidable Readmission From			All-Cause Readmission From		
Model Covariates	Community Discharge	Potentially Avoidable Readmit	All-Cause Readmit	All-Cause Readmit	Nursing Home	Home Health	Comm. or Other	Nursing Home	Home Health	Comm. or Other
Alzheimer's Disease	-0.487	-0.127	-0.131	-0.171	-0.243	-0.010	-0.025	-0.260	-0.010	-0.059
Atrial fibrillation / dysrhythmias	-0.018	0.034	-0.005	-0.038	0.019	0.188	0.134	-0.022	0.136	0.078
Electrolyte Imbalance	-0.175	0.154	0.090	0.083	0.092	0.144	0.201	0.004	0.064	0.125
Malnutrition, weight loss	-0.325	0.389	0.359	0.309	0.129	0.200	0.242	0.065	0.155	0.193
Psychotic Disorders / Psychoses	-0.875	-0.048	0.050	-0.055	-0.118	0.074	0.197	0.011	0.145	0.387
Coronary Artery Disease, MI	0.185	-0.246	-0.256	-0.342	-0.126	0.069	0.011	-0.111	0.073	0.018
Peripheral Vascular Disease	-0.266	0.078	0.134	0.070	0.003	0.106	0.083	0.013	0.152	0.122
Hemiplegia/Hemiparesis/Paralysis	-0.645	0.192	0.208	0.065	-0.146	-0.004	0.108	-0.169	0.019	0.146
Respiratory Failure/Disease	-0.177	0.201	0.166	0.148	0.052	0.092	0.047	0.021	0.071	0.024
c-index	0.69	0.65	0.63	0.65	0.63	0.65	0.65	0.61	0.61	0.62

Note: Grayed out estimates have p-values > .05 and are not statistically significant.

3.2 Facility-Level Results

3.2.1 SNF Quality Measure Rates for All SNFs in 2011

The SNF quality measures during the SNF stay were calculated for 13,161 SNFs with 25 or more SNF stays in fiscal year 2011. The requirement of 25 stays has been used in the MedPAC rate calculations since the original research published in 2006, and the requirement was re-evaluated for the current analyses and found to continue to be justified (Appendix A). The impact of requiring a minimum of 25 stays in 2011 resulted in loss of about 20% of facilities that in total did not include sufficient numbers of Medicare PPS stays to be important in the current analysis. Since the 2006 study there were more facilities excluded on this basis, probably reflecting industry differentiation with more facilities treating largely Medicare Managed Care and/or private pay skilled patients, or specializing in Memory Care or Alzheimer's Disease.

The average facility-level risk-adjusted rate of community discharge at 100 days was 27.8% for fiscal year 2011 (TABLE 5). This rate was calculated first at the facility level by aggregating all stays to obtain an observed rate, and then risk-adjusted at the facility level, and finally averaged across all facilities with 25 or more stays. Substantial variation across SNFs in risk-adjusted community discharge rates was still evident with a range from 0.0% to 83.5% and the interquartile range (middle 50% of facilities) from 21.7% to 34.7% (TABLE 6; FIGURE 1).

The average facility-level risk-adjusted rate of readmission in 100 days for the five potentially avoidable conditions was 19.2% for fiscal year 2011 (TABLE 5). Again significant variation existed among SNFs with the interquartile range from 14.8% to 23.4% and the range from 0.0% to 54.4% (TABLE 6; FIGURE 2). Average rates of readmission for all causes were also calculated and the 30-day risk-adjusted all-cause readmission rate for SNF admissions (i.e., hospital discharges to SNF) was 18.1% in 2011. This average SNF rate is lower than national rates reported for hospital discharges to all settings.

The newly developed risk-adjusted quality measure of readmission in the 30 days post SNF discharge for the five potentially avoidable conditions was 10% for fiscal year 2011 (TABLE 5). Again significant variation existed among SNFs with an interquartile range of 7.0 % to 12.5 % and a range from 0.0% to 40.6% (TABLE 6; FIGURE 3). Also newly developed, the average risk-adjusted readmission rate for all causes in the 30 days post-SNF discharge was 13.5%, with considerable variation among SNFs (TABLE 6).

Readmission for potentially avoidable conditions during the SNF stay and 30 days post SNF stay were found to be associated (Correlation of 0.21;$p<.0001$), suggesting that SNFs with better quality during the SNF stay with respect to readmission also have better quality in the post-discharge transition. Given the relationship between these two measures, a combined measure of readmission rates during the SNF stay and for the 30 days post SNF discharge was calculated, representing the entire episode of care including the SNF stay and discharge transition. The combined risk-adjusted rate of readmission during this episode was 34.3% for all causes and 27.4% for potentially avoidable conditions (TABLE 5).

TABLE 5: Average SNF Community Discharge and Hospital Readmission Rates During SNF Stay and 30 Days Post SNF Discharge Stay, (Fiscal Year 2011)

Outcome Measure	Rate
During SNF Stay[1]	
Community Discharge (at 100 Days)	
Observed	31.5%
Risk Adjusted	27.8%
Readmission Rates	
Five Potentially Avoidable Conditions (at 100 Days)	
Observed	19.1%
Risk Adjusted	19.2%
100 Day All-Cause	
Observed	23.7%
Risk Adjusted	23.8%
30 Day All-Cause	
Observed	18.3%
Risk Adjusted	18.1%
30 Days Post SNF Discharge Readmission Rates[2]	
Five Potentially Avoidable Conditions	
Observed	9.4%
Risk Adjusted	10.0%
All-Cause Readmissions	
Observed	12.6%
Risk Adjusted	13.5%
Combined During and 30 Days Post SNF Discharge Readmission Rates[1]	
Five Potentially Avoidable Conditions	
Observed	27.6%
Risk Adjusted	27.4%
All-Cause	
Observed	34.9%
Risk Adjusted	34.3%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge (N=13,161).

[2] Includes SNFs with 20 or more SNF stays excluding all deaths during SNF stay, 30 days post SNF discharge stay, and all readmissions during the SNF stay (N=12,688).

FIGURE 1: Distribution of Risk-Adjusted Community Discharge Rates During SNF Stay

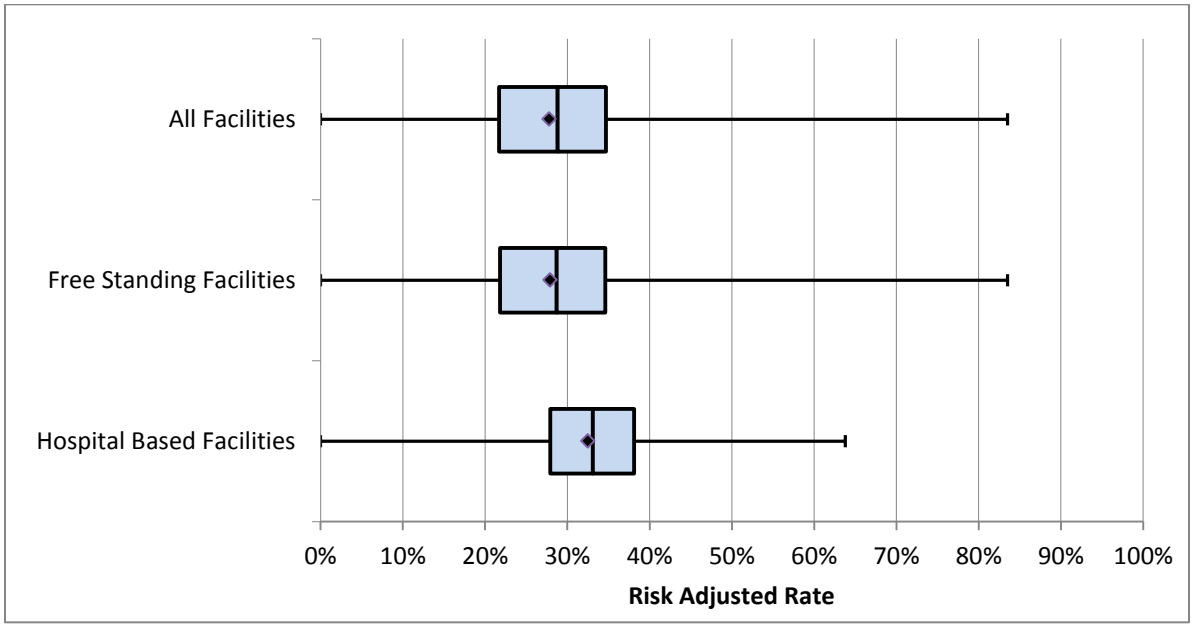


FIGURE 2: Distribution of Risk-Adjusted Readmission Rates for Five Potentially Avoidable Conditions During SNF Stay

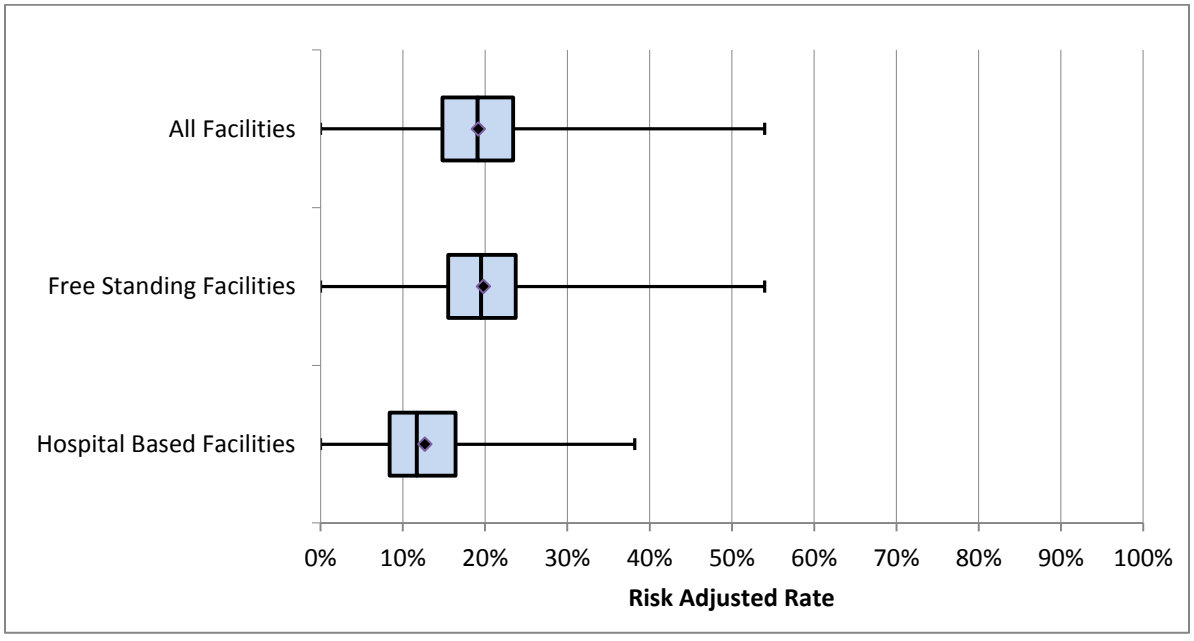


FIGURE 3: Distribution of Risk-Adjusted Readmission Rates for Five Potentially Avoidable Conditions 30 Days Post SNF Discharge Stay

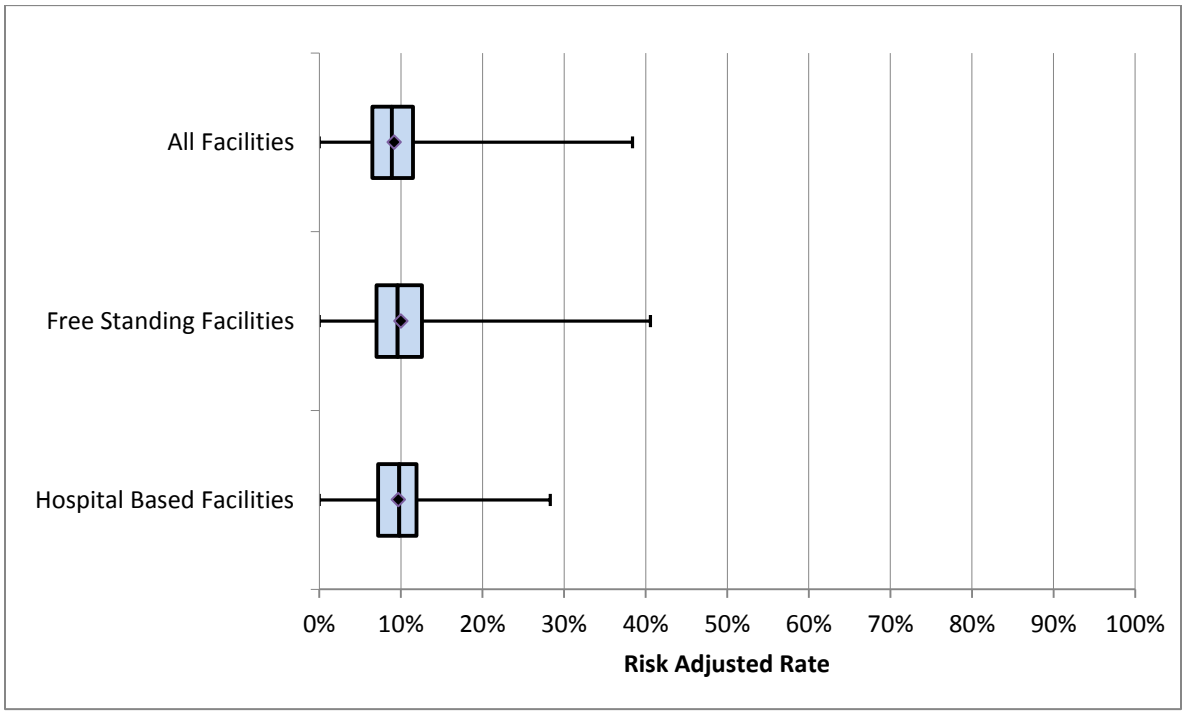


TABLE 6: Variation in Risk-Adjusted Outcome Measures for All SNFs

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Community Discharge Rate at 100 Days[1]	13,161	27.8%	0.0%	14.2%	21.7%	28.8%	34.7%	39.8%	83.5%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days[1]	13,161	19.2%	0.0%	10.6%	14.8%	19.1%	23.4%	27.8%	54.0%
All-Cause Readmission Rate at 100 Days[1]	13,161	23.8%	0.0%	14.2%	19.0%	23.8%	28.7%	33.7%	64.8%
All-Cause Readmission Rate at 30 Days[1]	13,161	18.1%	0.0%	10.5%	14.3%	18.1%	21.9%	25.8%	50.6%
30 Days Post SNF Discharge Potentially Avoidable Readmission Rate[2]	12,688	10.0%	0.0%	4.4%	7.0%	9.6%	12.5%	16.0%	40.6%
30 Days Post SNF Discharge All-Cause Readmission Rate[2]	12,688	13.5%	0.0%	7.0%	10.0%	13.1%	16.6%	20.5%	54.4%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 25 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

3.2.2 Relationship Between Facility Characteristics and SNF Quality Measures

Based on the 2011 stratified analysis, hospital-based SNFs as group continued to demonstrate higher rates of risk-adjusted community discharge than freestanding SNFs (FIGURE 1). The average risk-adjusted community discharge rate for the 654 hospital-based SNFs with 25 or more SNF stays was 32.5% in contrast to 27.9% for the 12,290 freestanding SNFs (APPENDIX B1). Hospital-based SNFs also demonstrated lower rates of readmission for potentially avoidable conditions on average (12.7% vs. 19.8%) and overall (FIGURE 2). However, rates of readmission in the 30 days post SNF discharge for potentially avoidable conditions and all conditions were similar between hospital-based and freestanding SNFs.

Moreover, in the facility-level multivariable regression analysis that adjusts for a range of facility and geographic factors, hospital-based SNFs showed a 2.6 percentage point higher rate of community discharge, a 5.2 percentage point lower rate of readmission during the SNF stay, but a 1.1 percentage point higher readmission rate in the post SNF discharge period (TABLES 7A, 7B, 7C).

Other facility characteristics were generally found to be quite modestly associated with risk-adjusted outcome rates (TABLES 7A, 7B, 7C). For example, for-profit ownership was associated with a 0.7 percentage point lower rate of community discharge, a 1.4 percentage point higher rate of readmission during the SNF stay, and a 0.8 percentage point higher rate of readmission in the 30 days post SNF discharge. While statistically significant due to the large sample sizes, the differences of less than 1.0% are not considered clinically meaningful. Government facilities did have a 4.2 percentage points lower rate of community discharge and a 1.5 percentage point lower rate of readmission during the SNF stay.

Geographic indicators based on the state in which the SNF was located were most strongly associated with risk-adjusted rates of community discharge, readmission during the SNF stay, and readmission during the 30 days following the SNF stay (TABLES 7A, 7B, 7C). Relative to Alaska (the state with the highest community discharge rate), community discharge rates were more than 20.7 percentage points lower in North Dakota, Arkansas, South Dakota, and Illinois. Relative to Utah (the state with the lowest readmission rate), readmission rates during the SNF stay were over 11.3 percentage points higher in Illinois and Louisiana, and over 9.0 percentage points higher in Oklahoma and Missouri. And relative to Alaska (the state with the lowest 30 days post SNF discharge readmission rate), rates were over 7.1 percentage points higher in Arkansas, Louisiana, Illinois, Maryland, and Arizona.

TABLE 7A: Multivariable Regression for Facility Community Discharge Rates During SNF Stay[1]

Covariate	Coefficient	p-Value
INTERCEPT	0.163	<.0001
HOSPITAL-BASED (VS. FREESTANDING)	0.026	<.0001
NON-PROFIT OWNERSHIP	Referent	-
FOR PROFIT OWNERSHIP	-0.007	<.0001
GOVERNMENT OWNERSHIP	-0.042	<.0001
URBAN LOCATION (VS. RURAL)	0.018	<.0001
CERTIFIED BEDS, LESS THAN 50 (VS. 50+)	0.024	<.0001
THERAPY, FTP/BED	0.088	<.0001
AK(02)-ALASKA	0.254	<.0001
UT(46)-UTAH	0.194	<.0001
HI(12)-HAWAII	0.190	<.0001
OR(38)-OREGON	0.182	<.0001
VT(47)-VERMONT	0.180	<.0001
ID(13)-IDAHO	0.179	<.0001
MT(27)-MONTANA	0.165	<.0001
ME(20)-MAINE	0.155	<.0001
WA(50)-WASHINGTON	0.153	<.0001
NV(29)-NEVADA	0.148	<.0001
AZ(03)-ARIZONA	0.147	<.0001
AL(01)-ALABAMA	0.145	<.0001
MD(21)-MARYLAND	0.143	<.0001
VA(49)-VIRGINIA	0.141	<.0001
NH(30)-NEW HAMPSHIRE	0.139	<.0001
CO(06)-COLORADO	0.139	<.0001
NC(34)-NORTH CAROLINA	0.134	<.0001
DE(08)-DELAWARE	0.133	<.0001
SC(42)-SOUTH CAROLINA	0.129	<.0001
NM(32)-NEW MEXICO	0.129	<.0001
TN(44)-TENNESSEE	0.128	<.0001
FL(10)-FLORIDA	0.127	<.0001
MN(24)-MINNESOTA	0.122	<.0001
MI(23)-MICHIGAN	0.122	<.0001

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

(Continued)

TABLE 7A: Multivariable Regression for Facility Community Discharge Rates During SNF Stay[1]

Covariate	Coefficient	p-Value
WI(52)-WISCONSIN	0.114	<.0001
MA(22)-MASSACHUSETTS	0.114	<.0001
CT(07)-CONNECTICUT	0.114	<.0001
OH(36)-OHIO	0.113	<.0001
WV(51)-WEST VIRGINIA	0.112	<.0001
IN(15)-INDIANA	0.110	<.0001
NJ(31)-NEW JERSEY	0.109	<.0001
PA(39)-PENNSYLVANIA	0.105	<.0001
WY(53)-WYOMING	0.102	<.0001
CA(05)-CALIFORNIA	0.098	<.0001
GA(11)-GEORGIA	0.098	<.0001
DC(09)-DISTRICT OF COLUMBIA	0.097	<.0001
NY(33)-NEW YORK	0.093	<.0001
KY(18)-KENTUCKY	0.091	<.0001
MS(25)-MISSISSIPPI	0.091	<.0001
TX(45)-TEXAS	0.077	<.0001
NE(28)-NEBRASKA	0.074	<.0001
OK(37)-OKLAHOMA	0.072	<.0001
KS(17)-KANSAS	0.072	<.0001
RI(41)-RHODE ISLAND	0.065	<.0001
MO(26)-MISSOURI	0.052	<.0001
IA(16)-IOWA	0.052	<.0001
IL(14)-ILLINOIS	0.046	<.0001
SD(43)-SOUTH DAKOTA	0.043	0.0006
AR(04)-ARKANSAS	0.039	<.0001
ND(35)-NORTH DAKOTA	0.003	0.8138
LA(19)-LOUISIANA	Referent	-

Adjusted $R^2 = 0.19$

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

TABLE 7B: Multivariable Regression for Facility Readmission Rates for Potentially Avoidable Conditions During SNF Stay [1]

Covariate	Coefficient	p-Value
INTERCEPT	0.126	<.0001
HOSPITAL-BASED (VS. FREESTANDING)	-0.052	<.0001
NON-PROFIT OWNERSHIP	Referent	-
FOR PROFIT OWNERSHIP	0.014	<.0001
GOVERNMENT OWNERSHIP	-0.015	<.0001
CERTIFIED BEDS, LESS THAN 50 (VS. 50+)	-0.013	<.0001
UT(46)-UTAH	Referent	-
HI(12)-HAWAII	0.002	0.8545
ID(13)-IDAHO	0.023	0.0382
CO(06)-COLORADO	0.027	0.0029
MT(27)-MONTANA	0.029	0.0217
WY(53)-WYOMING	0.030	0.0442
AL(01)-ALABAMA	0.030	0.0004
AK(02)-ALASKA	0.036	0.2561
MA(22)-MASSACHUSETTS	0.036	<.0001
DC(09)-DISTRICT OF COLUMBIA	0.036	0.0396
ME(20)-MAINE	0.038	0.0001
NH(30)-NEW HAMPSHIRE	0.041	0.0001
NM(32)-NEW MEXICO	0.043	<.0001
WA(50)-WASHINGTON	0.045	<.0001
OR(38)-OREGON	0.046	<.0001
NV(29)-NEVADA	0.046	0.0001
GA(11)-GEORGIA	0.047	<.0001
VT(47)-VERMONT	0.047	0.0005
ND(35)-NORTH DAKOTA	0.047	<.0001
SC(42)-SOUTH CAROLINA	0.050	<.0001
CA(05)-CALIFORNIA	0.050	<.0001
PA(39)-PENNSYLVANIA	0.051	<.0001
WV(51)-WEST VIRGINIA	0.052	<.0001
WI(52)-WISCONSIN	0.052	<.0001
AZ(03)-ARIZONA	0.054	<.0001
TN(44)-TENNESSEE	0.054	<.0001

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

(Continued)

TABLE 7B: Multivariable Regression for Facility Readmission Rates for Potentially Avoidable Conditions During SNF Stay [1]

Covariate	Coefficient	p-Value
DE(08)-DELAWARE	0.054	<.0001
CT(07)-CONNECTICUT	0.057	<.0001
AR(04)-ARKANSAS	0.057	<.0001
FL(10)-FLORIDA	0.058	<.0001
VA(49)-VIRGINIA	0.058	<.0001
OH(36)-OHIO	0.061	<.0001
NC(34)-NORTH CAROLINA	0.061	<.0001
MN(24)-MINNESOTA	0.062	<.0001
MD(21)-MARYLAND	0.063	<.0001
IA(16)-IOWA	0.064	<.0001
TX(45)-TEXAS	0.065	<.0001
NE(28)-NEBRASKA	0.065	<.0001
NJ(31)-NEW JERSEY	0.066	<.0001
NY(33)-NEW YORK	0.067	<.0001
RI(41)-RHODE ISLAND	0.068	<.0001
KS(17)-KANSAS	0.073	<.0001
KY(18)-KENTUCKY	0.073	<.0001
IN(15)-INDIANA	0.073	<.0001
SD(43)-SOUTH DAKOTA	0.075	<.0001
MI(23)-MICHIGAN	0.075	<.0001
MS(25)-MISSISSIPPI	0.085	<.0001
OK(37)-OKLAHOMA	0.091	<.0001
MO(26)-MISSOURI	0.094	<.0001
IL(14)-ILLINOIS	0.114	<.0001
LA(19)-LOUISIANA	0.119	<.0001

Adjusted $R^2 = 0.16$

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

TABLE 7C: Multivariable Regression for Facility Readmission Rates for Potentially Avoidable Conditions 30 Days Post SNF Discharge [1]

Covariate	Coefficient	p-Value
INTERCEPT	0.007	0.7567
HOSPITAL-BASED (VS. FREESTANDING)	0.011	<.0001
NON-PROFIT OWNERSHIP	Referent	-
FOR PROFIT OWNERSHIP	0.008	<.0001
GOVERNMENT OWNERSHIP	-0.005	0.0306
URBAN LOCATION (VS. RURAL)	0.007	<.0001
% NURSING HOME LOCATION	0.043	<.0001
% HOME HEALTH LOCATION	0.015	0.0007
% COMMUNITY LOCATION	Referent	-
AK(02)-ALASKA	Referent	-
UT(46)-UTAH	0.029	0.2061
ID(13)-IDAHO	0.032	0.1618
HI(12)-HAWAII	0.034	0.1541
MT(27)-MONTANA	0.036	0.1219
DC(09)-DISTRICT OF COLUMBIA	0.038	0.1307
SD(43)-SOUTH DAKOTA	0.039	0.0879
VT(47)-VERMONT	0.042	0.0769
NH(30)-NEW HAMPSHIRE	0.043	0.0609
WI(52)-WISCONSIN	0.046	0.0379
ND(35)-NORTH DAKOTA	0.048	0.0394
WY(53)-WYOMING	0.050	0.0347
CT(07)-CONNECTICUT	0.051	0.0220
PA(39)-PENNSYLVANIA	0.052	0.0190
KS(17)-KANSAS	0.052	0.0184
MA(22)-MASSACHUSETTS	0.053	0.0175
WA(50)-WASHINGTON	0.054	0.0158
NE(28)-NEBRASKA	0.054	0.0166
SC(42)-SOUTH CAROLINA	0.054	0.0149
CO(06)-COLORADO	0.054	0.0150
OR(38)-OREGON	0.054	0.0149
NY(33)-NEW YORK	0.055	0.0129

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

(Continued)

TABLE 7C: Multivariable Regression for Facility Readmission Rates for Potentially Avoidable Conditions 30 Days Post SNF Discharge [1]

Covariate	Coefficient	p-Value
VA(49)-VIRGINIA	0.056	0.0118
NC(34)-NORTH CAROLINA	0.056	0.0113
AL(01)-ALABAMA	0.056	0.0112
RI(41)-RHODE ISLAND	0.057	0.0123
IN(15)-INDIANA	0.057	0.0103
ME(20)-MAINE	0.057	0.0111
FL(10)-FLORIDA	0.058	0.0089
TN(44)-TENNESSEE	0.058	0.0091
DE(08)-DELAWARE	0.058	0.0116
IA(16)-IOWA	0.059	0.0081
OH(36)-OHIO	0.061	0.0059
MI(23)-MICHIGAN	0.061	0.0057
CA(05)-CALIFORNIA	0.062	0.0051
NV(29)-NEVADA	0.062	0.0067
OK(37)-OKLAHOMA	0.064	0.0042
NM(32)-NEW MEXICO	0.064	0.0048
NJ(31)-NEW JERSEY	0.066	0.0028
WV(51)-WEST VIRGINIA	0.066	0.0033
MN(24)-MINNESOTA	0.066	0.0028
GA(11)-GEORGIA	0.067	0.0026
KY(18)-KENTUCKY	0.067	0.0023
MS(25)-MISSISSIPPI	0.069	0.0021
TX(45)-TEXAS	0.069	0.0018
MO(26)-MISSOURI	0.070	0.0015
AZ(03)-ARIZONA	0.072	0.0012
MD(21)-MARYLAND	0.073	0.0011
IL(14)-ILLINOIS	0.075	0.0007
LA(19)-LOUISIANA	0.081	0.0003
AR(04)-ARKANSAS	0.085	0.0001

Adjusted $R^2 = 0.08$

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

4.0 DISCUSSION AND CONCLUSIONS

4.1 Calculation of risk-adjusted quality measures for SNFs during the SNF stay is feasible for more current time periods than with previous data files; however, due to discontinuity of time periods and methods, these Fiscal Year 2011 results should be viewed as a new baseline for trending going forward.

The two SNF quality measures that MedPAC has annually reported (Community Discharge and Readmission for Five Potentially Avoidable Conditions in 100 days) have in the past been calculated from the DataPRO file constructed from claims data and MDS 2.0 data. With the change to MDS 3.0, Medicare stays can be more easily linked between raw claims and MDS data to produce a more current analytic file for calculating SNF quality measures. The improved data fields in MDS 3.0 also are sufficient for estimating risk models for determining the probability of outcomes occurring for individual residents to generate expected rates for facility measures. Using similar methods to those we used in the past, we were able to estimate valid risk-adjusted quality measures that are more current than previously reported.

With the change in data, and the discontinuity in time periods, however, there are enough differences between previous calculations and the new calculations that comparing rates over time using the two different approaches could be misleading. While rates are close, this report is best used to establish a new baseline (Fiscal Year 2011) that can be used for comparisons going forward, rather than comparing with prior rates.

4.2 Rates of readmission in 30 days post-SNF discharge are substantial; and risk-adjustment for comparing across SNFs is feasible by determining probability of readmission separately for Medicare beneficiaries discharged from SNF to different locations.

MedPAC's interest in readmission after SNF discharge is substantiated by the significant rate of readmission to acute care that occurs following discharge from SNFs. All-cause readmission to hospital within 30 days of SNF discharge occurred in 14.0% of the SNF patients that were discharged to community without home health care, 12.8% of the SNF patients that were discharged to home health care, and 11.4% of the SNF patients that were discharged to long-term nursing home care (five potentially avoidable cause readmission rates were 9.8%, 9.4%, and 8.8%, respectively).

The 24.1% of SNF discharges that went home without home health care, the 45.3% of SNF discharges that went home with home health care, and the 30.6% of SNF discharges to nursing home care profoundly differed in functional status, cognition, demographics, risk of adverse events, and comorbidity. Thus, comparisons across these alternative post SNF discharge settings would not be valid, and different risk models were required for each setting to estimate the probability of readmission. However, predictive risk models were successfully estimated by discharge location as the basis for calculating risk-adjusted readmission rates at the SNF level that can be validly compared and tracked.

4.3 Readmission in 30 days post SNF discharge offers a promising quality measure to encourage coordination of care across care episodes.

The newly developed quality measure of readmission in the 30 days post SNF discharge parallels the measure being used for hospitals and will encourage improved care transitions after SNF discharge. The national risk-adjusted facility rate of 13.5% for all conditions and 10.0% for the potentially avoidable conditions of Heart Failure, Urinary Tract Infection, Respiratory Infection, Sepsis, and Electrolyte Imbalance suggest that tracking hospital discharges after the transition to SNF and into the next level of care is important for the Medicare program. This is the first look at outcomes of transitions following SNF discharge. Considerable variation existed among SNFs that may indicate differences in SNF discharge practices and coordination across the continuum.

With the 30 days post SNF discharge quality measures new light has been shed on quality of care provided in hospital-based SNFs. The fiscal year 2011 analysis supported the previous findings that hospital-based SNFs had higher community discharge rates and lower readmission rates for potentially avoidable conditions during the SNF stay. Based on the SNF measure of readmission for potentially avoidable conditions in the 30 days post SNF discharge, however, freestanding SNFs demonstrated a modestly lower readmission rate than hospital-based SNFs.

Interestingly, the rate of readmission in the 30 days post-discharge from SNF was correlated with the rate of readmission during the SNF stay, suggesting a relationship between quality during the SNF stay and the care transition. Given this result and the growing integration of care across post-acute settings, a combined risk-adjusted measure of readmission during the SNF stay through 30 days post SNF discharge was developed. Over one-third of SNF admissions were readmitted during this combined episode (34.3%), with 27.4% readmitted for a potentially avoidable condition.

4.4 Dual-Eligible Medicare SNF Admissions were twice as likely to remain in nursing homes for long-term care than Non-Dual Eligible SNF Admissions.

Over one-third of SNF stays in FY2011 were for dual-eligible beneficiaries. Dual-eligible beneficiaries were more likely to be less than 65, unmarried, more functionally impaired, and had greater physical, cognitive, and mental health comorbidity. Even after controlling for these differences in characteristics, however, they were more likely to become long-term residents of nursing homes.

Also of note is the finding that rates of all-cause 30-day readmission to hospital were lower for dual-eligible beneficiaries after controlling for case mix. This may reflect unmeasured differences between dual-eligible beneficiaries and non-dual eligible beneficiaries, such as differences in preferences or social supports that might influence the decision to readmit. Care differences could also exist for dual-eligible beneficiaries that either prevent readmission or lead to advance care planning so preferences are known and honored.

4.5 Community discharge and readmission rates in 2011 varied substantially among SNFs.

The risk-adjusted rate of community discharge within 100 days of SNF admission varied considerably around the average of 27.8%. The lowest decile of facilities had rates from 0.0% to 14.2% and the highest decile of facilities had rates between 39.8% and 83.5%, while the middle half of the facilities had rates between 21.7% and 34.7% (the interquartile range). These rates were adjusted for a range of demographic, functional, and comorbid conditions. Facility-level analysis of risk-adjusted rates suggested that differences related primarily to geographic differences, whether the facility was hospital-based, and the number of full time equivalent therapy positions per bed. These latter two facility characteristics could influence rehabilitation orientation and/or availability and qualification of therapy staff in the facility. Public reporting and incentives for rehabilitation and community discharge, such as the current hospital incentives for reducing readmission, have the potential to improve SNF rehabilitation outcomes particularly for underperforming SNFs, and reduce the variation.

Risk-adjusted readmission for potentially avoidable conditions within 100 days of SNF admission averaged 19.2% for Medicare stays in 2011. The lowest 10 percentile had less than half that rate and the highest 10 percentile had rates from 27.8% to 54.0%, with the interquartile range (half the facilities) in the range of 14.8 % to 23.4%. These rates were adjusted for demographic, functional, comorbid conditions, and other risk factors suggesting that while some SNFs are successfully reducing readmissions, others are struggling to do so. The result is similar for all-cause readmission in 30 days—the measure that is important in the context of the Hospital Readmission Reduction Act. While the average rate for SNFs is 18.1%, which is less than the rate for all hospital discharges, the worst-performing decile had risk-adjusted rates in excess of 25.8% in contrast to high performers with risk-adjusted rates at 10.5% or below. With the advent of hospital penalties for readmission beginning in 2011 and the industry-wide emphasis on reducing readmissions, these 2011 risk-adjusted rates will provide a rigorous national baseline for measuring future trends in a timely manner.

4.6 Risk-adjusted SNF outcome measures were most strongly influenced by geographic differences, suggesting that practice patterns and service availability vary substantially.

The most variation in the risk-adjusted quality measures for SNFs was explained by the state in which the SNF was located. Community discharge rates were more than 20.7 percentage points lower in the states with the lowest rates relative to the state with the highest rate. Readmission rates during the SNF stay for the five potentially avoidable conditions were over 11.3 percentage points higher in the states with the highest rate relative to the readmission rate in the lowest state. Readmission rates in the 30 days post-SNF discharge were over 7.1 percentage points higher in the states with the highest rate relative to the readmission rate in the lowest state. These differences dominate facility variation in SNF quality measures related to community discharge and readmission. Situations in which geographic variation exist to this extent are important to understand and address in order to improve care for all beneficiaries in the Medicare program.

Appendix A

Determination of Minimum Sample Size Requirements for SNF Stay and 30 Days Post-SNF Stay Outcome Measures

APPENDIX A
Determination of Minimum Sample Size Requirements for SNF Stay and 30 Days Post SNF Stay Outcome Measures

Analysis Methods: In the previous analysis of minimum sample size requirements for SNF Quality Measures, simulation and bootstrap methods were employed to empirically generate outcome measure variation by facility volume based on 2004 data. The variation was also theoretically derived for a facility of outcome rate = 50% (where the resident expected rate follows a normal distribution with mean=0.5 and SD=1.0, truncated at 0 and 1) given a national rate equal to 20% as an example. Based on these analyses, a volume of 25 stays was identified as the point at which measure variance did not decrease appreciably while retaining close to 90% of the facilities. Because all three methods used in the 2004 analysis yielded similar patterns for the outcome measure variance in relation to facility volume, only the theoretical method was used in this re-examination of minimum sample size requirements for the current SNF stay measures and the new 30 days post SNF discharge measure.

Given the lower rates of readmission in the 30 days post SNF period (average of 10% in contrast to about 20%) variance for the smaller rate was calculated for various sample sizes and compared with the variance calculations for the higher rate. In each situation, an average facility exhibiting the national rate was considered as a representative facility. Cut points below and above 25 were evaluated for the SNF stay measures, the post SNF discharge measures, and the combined measure.

Results: Variation of the estimated facility rate was theoretically derived and plotted in Figure A.1. As expected, the plot with a rate at an average of 20% (dotted line) followed the two empirically generated curves in the initial analysis (Donelan-McCall et al. 2006). The standard deviation (SD) decreased from 0.09 to 0.08 between the number of contributing stays (N) = 20 and N=25, and from 0.08 to 0.075 between N = 25 and N=30. The outcome measure SD eventually decreased to about 0.055 at N = 50. The number of facilities excluded in fiscal year 2011 was greater at each minimum sample size than in 2004. For a sample size of 15, 12.6 % of facilities were lost in 2011 in contrast to 5% of facilities in 2004. For a sample size of 20, 16.4% of facilities were lost in 2011 in contrast to 7.5% of facilities in 2004. For a sample size of 25, 20.2% of facilities were lost in 2011 in contrast to 10% in 2004 (Table A.1). The concentration of Medicare PPS reimbursed SNF stays in fewer facilities may reflect a trend toward increasing differentiation of nursing centers into Medicare PPS reimbursed SNF vs. managed care and private pay residents, or those with longer stays. Despite the higher attrition rate in fiscal year 2011 at a minimum sample size of 25 stays, the stability of the estimate for the average rate of about 20% for the during SNF stay measures was determined to be appropriate to maintain.

With an average readmission rate of about 10% for the 30 days post SNF discharge measure, the variation at different sample sizes was depicted by the solid line in Figure A.1. The SD decreased from 0.08 to 0.065 between N = 15 and 20; and from 0.065 to 0.06 between N = 20 and 25, eventually declining to 0.04 at N = 50. Compared to the minimum sample size of 25 for an outcome rate of 20% with SD equal to 0.08 and a rate of decrease (slope) equal to 0.0016 per stay (point A), the minimum sample size of 20 for outcome rate at 10% seems to provide comparable stability (SD=0.067) and at a rate of decrease=0.0017 per stay. Beginning with the

base of facilities with 25 SNF stays, 96.4% of the facilities included in the analysis were retained for the 30 days post SNF discharge outcome measures.

Conclusion: A theoretical analysis re-examining the minimum sample size required for stability of facility measure estimation suggests that the previous guideline of 25 contributing stays is still adequate for during SNF stay measures, but results in greater attrition of facilities in 2011 than in 2004. Results of the analysis showed that lowering the minimum number of stays to 20 for the 30 days post SNF discharge measure provided similar stability to a sample of 25 for SNF stay measures. Only 3.6% of facilities are additionally excluded for the 30 days post SNF discharge period while maintaining stability of estimation.

TABLE A1: Number and Percent of SNF Attrition by Death, Readmission, and Number of Contributing Stays Exclusions

During SNF Stay Outcome Measures for Community Discharge and Readmission at 100 Days and Readmission at 30 Days. (Excludes all deaths during SNF stay unless readmission on or within one day of SNF discharge)

			SNF Attrition	
Contributing Stays per Facility	Total Stays	Total SNFs	Number	Percent [2]
1 or More	1,867,190	16,487	0	0.0%
15 or More	-	14,416	2,071	12.6%
20 or More	-	13,784	2,703	16.4%
25 or More [1]	-	13,161	3,326	20.2%

30 days Post SNF Discharge Outcome Measures for Readmission. (Excludes all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay)

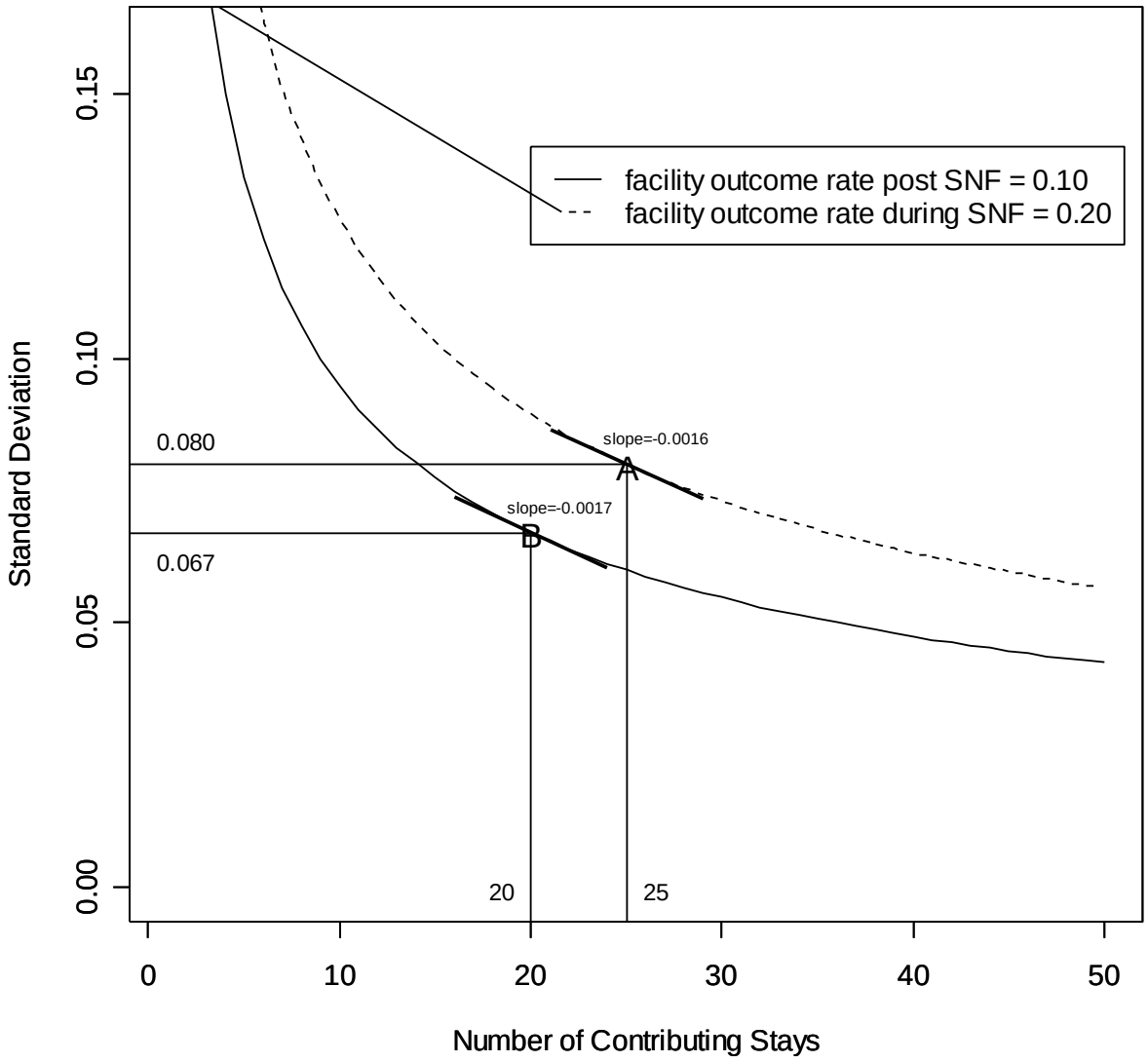
			SNF Attrition	
Contributing Stays per Facility	Total Stays	Total SNFs	Number	Percent [4]
1 or More	1,302,393	13,161	0	0.0%
15 or More	-	13,096	65	0.5%
20 or More [3]	-	12,688	473	3.6%
25 or More	-	11,846	1,315	10.0%

30 days Post SNF Discharge Outcome Measures for Readmission. (Excludes all deaths and readmissions during the SNF stay but includes all deaths and readmissions 30 days post SNF discharge)

			SNF Attrition	
Contributing Stays per Facility	Total Stays	Total SNFs	Number	Percent [4]
1 or More	1,319,987	13,161	0	0.0%
15 or More	-	13,104	57	0.4%
20 or More [3]	-	12,727	434	3.3%
25 or More	-	11,911	1,250	9.5%

[1] Used to construct during SNF at 100 and 30 day outcome measures.
[2] Percent attrition based on 16,487 SNF base.
[3] Used to construct 30 days post SNF discharge outcome measures.
[4] Percent attrition based on 13,161 SNF base.

FIGURE A1: Theoretically Derived Standard Deviation of Average Facility Rates of Outcome Measures



Appendix B

Risk-Adjusted Outcome Measures Stratified by SNF Characteristics

TABLE B1: Risk-Adjusted Outcome Measures Stratified by **Freestanding, Hospital-Based, and Swing Bed SNFs**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Freestanding SNFs									
Community Discharge Rate at 100 Days [1]	12,290	27.9%	0.0%	15.0%	21.8%	28.7%	34.6%	39.6%	83.5%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	12,290	19.8%	0.0%	11.9%	15.5%	19.5%	23.7%	28.1%	54.0%
All-Cause Readmission Rate at 100 Days [1]	12,290	24.6%	0.0%	15.7%	19.8%	24.3%	29.0%	34.1%	64.8%
All-Cause Readmission Rate at 30 Days [1]	12,290	18.6%	0.0%	11.5%	14.9%	18.4%	22.2%	26.0%	50.6%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	11,863	10.0%	0.0%	4.5%	7.0%	9.6%	12.6%	16.1%	40.6%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	11,863	13.6%	0.0%	7.0%	10.0%	13.1%	16.6%	20.7%	54.4%
Hospital-Based SNFs									
Community Discharge Rate at 100 Days [1]	654	32.5%	0.0%	21.0%	27.9%	33.1%	38.1%	42.9%	63.8%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	654	12.7%	0.0%	6.0%	8.4%	11.7%	16.4%	20.9%	38.2%
All-Cause Readmission Rate at 100 Days [1]	654	16.3%	0.0%	8.5%	11.5%	15.2%	20.7%	25.1%	45.7%
All-Cause Readmission Rate at 30 Days [1]	654	13.7%	0.0%	7.1%	9.9%	13.0%	17.1%	21.1%	40.3%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	646	9.7%	0.0%	4.7%	7.2%	9.8%	11.9%	14.4%	28.3%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	646	13.0%	0.0%	7.6%	10.2%	13.0%	15.5%	18.4%	32.5%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

(Continued)

TABLE B1: Risk Adjusted Outcome Measures Stratified by **Freestanding, Hospital-Based, and Swing Bed SNFs**

Swing Bed SNFs

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Community Discharge Rate at 100 Days [1]	217	4.6%	0.0%	0.0%	0.0%	1.8%	6.7%	12.5%	51.6%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	217	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	8.9%
All-Cause Readmission Rate at 100 Days [1]	217	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	8.4%
All-Cause Readmission Rate at 30 Days [1]	217	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	8.8%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	179	9.2%	0.0%	0.0%	4.7%	8.3%	13.3%	17.4%	28.5%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	179	12.1%	0.0%	2.5%	6.4%	12.5%	16.1%	21.4%	43.5%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

TABLE B2: Freestanding SNF Risk-Adjusted Outcome Measures Stratified by **Ownership**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
For Profit SNFs									
Community Discharge Rate at 100 Days [1]	9,229	27.9%	0.0%	14.7%	21.8%	28.7%	34.6%	39.7%	83.5%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	9,229	20.3%	0.0%	12.5%	16.0%	19.9%	24.1%	28.5%	54.0%
All-Cause Readmission Rate at 100 Days [1]	9,229	25.2%	0.0%	16.3%	20.3%	24.7%	29.4%	34.6%	64.8%
All-Cause Readmission Rate at 30 Days [1]	9,229	18.8%	0.0%	11.8%	15.1%	18.6%	22.3%	26.1%	50.6%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	8,897	10.3%	0.0%	4.8%	7.3%	9.9%	12.8%	16.3%	40.6%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	8,897	13.9%	0.0%	7.4%	10.4%	13.4%	16.9%	21.1%	54.4%
Non-Profit SNFs									
Community Discharge Rate at 100 Days [1]	2,682	28.8%	0.0%	16.5%	22.8%	29.4%	35.0%	39.9%	63.9%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	2,682	18.7%	0.0%	10.8%	14.3%	18.4%	22.5%	27.1%	52.2%
All-Cause Readmission Rate at 100 Days [1]	2,682	23.1%	0.0%	14.0%	18.3%	22.7%	27.6%	32.4%	56.8%
All-Cause Readmission Rate at 30 Days [1]	2,682	18.2%	0.0%	10.5%	14.4%	18.1%	21.9%	26.1%	45.4%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	2,602	9.2%	0.0%	3.9%	6.1%	8.9%	11.8%	15.1%	33.3%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	2,602	12.5%	0.0%	5.8%	9.0%	12.2%	15.6%	19.2%	41.0%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

(Continued)

TABLE B2: Freestanding SNFs Risk Adjusted Outcome Measures Stratified by **Ownership**

Government SNFs

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Community Discharge Rate at 100 Days [1]	379	23.4%	0.0%	9.7%	16.8%	24.3%	30.2%	36.5%	52.5%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	379	17.5%	0.0%	9.3%	13.0%	17.3%	22.2%	26.7%	39.9%
All-Cause Readmission Rate at 100 Days [1]	379	22.1%	0.0%	12.9%	17.1%	21.8%	27.5%	31.6%	46.0%
All-Cause Readmission Rate at 30 Days [1]	379	16.9%	0.0%	9.3%	13.2%	16.6%	20.7%	24.2%	35.5%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	364	9.2%	0.0%	3.4%	5.6%	8.4%	12.0%	15.6%	30.2%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	364	12.3%	0.0%	5.7%	8.4%	11.5%	15.8%	19.0%	39.4%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

TABLE B3: Hospital-Based SNF Risk-Adjusted Outcome Measures Stratified by **Ownership**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
For Profit SNFs									
Community Discharge Rate at 100 Days [1]	104	32.2%	5.3%	19.1%	27.3%	32.5%	38.6%	42.3%	56.9%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	104	12.7%	0.0%	5.8%	7.7%	11.1%	17.1%	21.2%	32.9%
All-Cause Readmission Rate at 100 Days [1]	104	16.6%	2.9%	8.5%	11.3%	15.1%	21.0%	27.0%	45.7%
All-Cause Readmission Rate at 30 Days [1]	104	13.6%	0.0%	7.8%	9.5%	12.6%	17.5%	21.6%	40.3%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	101	10.5%	0.0%	5.6%	7.8%	10.4%	13.0%	15.8%	24.6%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	101	14.0%	3.4%	7.8%	11.0%	13.3%	17.3%	19.7%	25.4%
Non-Profit SNFs									
Community Discharge Rate at 100 Days [1]	456	33.0%	0.0%	23.2%	28.5%	33.3%	38.1%	42.3%	62.7%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	456	12.9%	0.0%	6.2%	8.6%	11.9%	16.3%	21.1%	38.2%
All-Cause Readmission Rate at 100 Days [1]	456	16.4%	0.0%	9.0%	11.9%	15.3%	20.4%	25.2%	42.0%
All-Cause Readmission Rate at 30 Days [1]	456	13.9%	0.0%	7.6%	10.1%	13.2%	17.0%	21.3%	36.2%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	454	9.7%	0.0%	4.8%	7.2%	9.9%	11.8%	14.3%	28.3%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	454	12.9%	0.0%	7.6%	10.2%	13.0%	15.5%	17.9%	32.5%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

(Continued)

TABLE B3: Hospital-Based SNFs Risk Adjusted Outcome Measures Stratified by **Ownership**

Government SNFs

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Community Discharge Rate at 100 Days [1]	94	30.2%	0.0%	13.1%	25.2%	31.8%	37.3%	43.6%	63.8%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	94	11.9%	0.0%	3.7%	7.4%	11.6%	16.2%	19.6%	25.8%
All-Cause Readmission Rate at 100 Days [1]	94	15.7%	3.5%	7.2%	9.9%	14.0%	21.8%	24.1%	34.2%
All-Cause Readmission Rate at 30 Days [1]	94	12.9%	0.0%	5.8%	8.5%	11.9%	17.3%	20.1%	31.2%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	91	8.9%	0.0%	3.8%	6.5%	8.6%	11.1%	13.5%	23.2%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	91	12.2%	0.0%	7.3%	9.5%	12.2%	14.1%	17.2%	29.7%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.

[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

TABLE B4: Freestanding SNF Risk-Adjusted Outcome Measures Stratified by **Urban/Rural Location**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Urban SNFs									
Community Discharge Rate at 100 Days [1]	9,093	28.7%	0.0%	15.6%	22.8%	29.7%	35.3%	40.2%	83.5%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	9,093	19.9%	0.0%	12.4%	15.9%	19.6%	23.6%	27.7%	54.0%
All-Cause Readmission Rate at 100 Days [1]	9,093	24.7%	0.0%	16.1%	20.0%	24.2%	28.8%	33.6%	64.8%
All-Cause Readmission Rate at 30 Days [1]	9,093	18.8%	0.0%	11.9%	15.2%	18.6%	22.2%	25.8%	50.6%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	8,847	10.2%	0.0%	4.8%	7.3%	9.8%	12.6%	15.9%	40.6%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	8,847	13.8%	0.0%	7.4%	10.4%	13.3%	16.7%	20.5%	54.4%
Rural SNFs									
Community Discharge Rate at 100 Days [1]	3,197	25.8%	0.0%	13.6%	19.7%	26.2%	32.1%	37.6%	59.9%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	3,197	19.7%	0.0%	10.8%	14.5%	19.3%	24.3%	29.6%	52.5%
All-Cause Readmission Rate at 100 Days [1]	3,197	24.5%	0.0%	14.3%	18.9%	24.3%	29.7%	35.4%	58.0%
All-Cause Readmission Rate at 30 Days [1]	3,197	18.1%	0.0%	10.2%	13.8%	17.8%	22.0%	26.7%	43.4%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	3,016	9.7%	0.0%	3.7%	6.1%	9.1%	12.6%	16.7%	39.1%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	3,016	12.9%	0.0%	5.6%	8.9%	12.3%	16.5%	21.0%	43.7%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

TABLE B5: Hospital-Based SNF Risk-Adjusted Outcome Measures Stratified by **Urban/Rural Location**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Urban SNFs									
Community Discharge Rate at 100 Days [1]	405	33.6%	0.0%	23.6%	29.3%	33.7%	38.6%	43.7%	62.7%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	405	12.8%	0.0%	6.1%	8.4%	11.5%	16.2%	21.6%	38.2%
All-Cause Readmission Rate at 100 Days [1]	405	16.5%	0.0%	8.9%	11.5%	15.1%	20.9%	25.9%	45.7%
All-Cause Readmission Rate at 30 Days [1]	405	13.9%	0.0%	7.7%	10.2%	12.9%	17.1%	21.3%	40.3%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	399	9.8%	0.0%	4.8%	7.2%	10.0%	12.0%	14.3%	23.2%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	399	13.1%	1.8%	7.6%	10.4%	13.2%	15.5%	18.3%	29.7%
Rural SNFs									
Community Discharge Rate at 100 Days [1]	249	30.7%	0.0%	17.8%	25.6%	31.5%	36.9%	41.9%	63.8%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	249	12.6%	0.0%	5.4%	8.7%	12.1%	16.8%	19.9%	28.6%
All-Cause Readmission Rate at 100 Days [1]	249	16.0%	2.9%	8.3%	10.9%	15.5%	20.5%	24.3%	34.2%
All-Cause Readmission Rate at 30 Days [1]	249	13.4%	0.0%	6.7%	9.2%	13.1%	17.0%	20.9%	27.7%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	247	9.6%	0.0%	4.3%	7.1%	9.2%	11.8%	14.6%	28.3%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	247	12.7%	0.0%	7.3%	9.7%	12.6%	15.5%	18.6%	32.5%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.

TABLE B6: Swing Bed SNF Risk-Adjusted Outcome Measures Stratified by **Urban/Rural Location**

	N	Mean	Min	10th Pctl	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Max
Urban SNFs									
Community Discharge Rate at 100 Days [1]	35	3.6%	0.0%	0.0%	0.0%	0.0%	6.4%	10.1%	21.6%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	35	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	8.9%
All-Cause Readmission Rate at 100 Days [1]	35	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	8.4%
All-Cause Readmission Rate at 30 Days [1]	35	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	8.8%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	26	11.2%	0.0%	3.0%	4.8%	10.1%	14.8%	24.7%	25.9%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	26	15.2%	0.0%	4.9%	9.4%	14.8%	21.4%	28.0%	34.2%
Rural SNFs									
Community Discharge Rate at 100 Days [1]	182	4.8%	0.0%	0.0%	0.0%	2.0%	7.2%	13.1%	51.6%
Readmission Rate for Potentially Avoidable Diagnoses at 100 Days [1]	182	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	8.2%
All-Cause Readmission Rate at 100 Days [1]	182	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	7.7%
All-Cause Readmission Rate at 30 Days [1]	182	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	7.4%
Post SNF Discharge Potentially Avoidable Readmission Rate Within 30 Days [2]	153	8.8%	0.0%	0.0%	4.7%	8.0%	12.9%	15.8%	28.5%
Post SNF Discharge All-Cause Readmission Rate Within 30 Days [2]	153	11.5%	0.0%	2.2%	6.3%	11.7%	15.6%	20.0%	43.5%

[1] Includes SNFs with 25 or more SNF stays excluding all deaths during SNF stay unless readmission on or within one day of SNF discharge.
[2] Includes SNFs with 20 or more SNF stays excluding all deaths during and 30 days post SNF discharge and all readmissions during the SNF stay.