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Post-Acute Care Episode Risk Adjustment Extrapolation Analyses

Final Report

Prepared for

Susan Bogasky

Assistant Secretary for Planning and Evaluation (ASPE)
U.S. Department of Health and Human Services
Hubert H. Humphrey Building
200 Independence Avenue, SW
Washington, DC 20201

Prepared by

Melissa Morley, PhD

Nicole Coomer, PhD

Nan Tracy Zheng, PhD

Anne Deutsch, PhD

Melvin Ingber, PhD

Laurie Coots, MS, MA

Cynthia Kelleher, MBA, MPH

Danielle Garfinkel, BA

RTI International

3040 Cornwallis Road

Research Triangle Park, NC 27709

Barbara Gage, PhD

The Brookings Institution

RTI Project Number 0212050.016.000

This report was produced under the direction of Susan Bogasky, Project Officer, Office of the Assistant Secretary for Planning and Evaluation (ASPE), Office of Health Policy. The findings and conclusions of this report are those of the authors and do not necessarily represent the views of ASPE or HHS.



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RTI International is a trade name of
Research Triangle Institute.

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1. BACKGROUND

This work with the Office of the Assistant Secretary for Planning and Evaluation (ASPE) builds upon RTI International's previous work with ASPE on episodes of post-acute care (PAC) and work with the Centers for Medicare & Medicaid Services (CMS) in the Post-Acute Care Payment Reform Demonstration (PAC PRD; Gage, Morley, Ingber, & Smith, 2011; Gage et al., 2012). It also builds directly on earlier work in which RTI used Medicare claims data to construct episodes of care for beneficiaries in the PAC PRD (Morley et al., 2011). In that work ASPE and RTI developed risk adjustment models predicting PAC episode payments and outcomes using the Continuity Assessment Record and Evaluation (CARE) Item Set data collected as part of the PAC PRD. The goals of the current work are to learn more about how currently available assessment data, Medicare claims data, or other data could be used to risk adjust episode costs, rather than episode payments, and to extrapolate the results of earlier work on the PAC PRD sample to the larger Medicare population.

1.1 PAC PRD and the CARE Item Set Data

The PAC PRD was mandated in Section 5008 of the Deficit Reduction Act of 2005. This demonstration examined the relative costliness and outcomes of cases admitted to different settings for treatment of similar conditions. The CARE Item Set is a standardized set of items used to measure patient characteristics in the acute hospital and all four PAC settings: long-term care hospitals (LTCHs), inpatient rehabilitation facilities (IRFs), home health agencies (HHAs), and skilled nursing facilities (SNFs).

The PAC PRD began collecting data in March 2008. In the first phase of data collection, through December 2009,¹ data were collected from 140 providers in geographically diverse markets. The market areas were chosen to represent both rural and urban populations, as well as areas with different numbers of PAC providers. Each participating provider collected CARE data on 200–250 Medicare beneficiaries over a 9-month data collection period. Participating providers included short-stay acute hospitals, which collected CARE at discharge, and the four post-acute settings (LTCHs, IRFs, HHAs, and SNFs), which collected CARE data at admission and discharge.

The CARE Item Set comprises a uniform set of patient assessment items designed to measure differences in patient severity, resource needs, and outcomes for patients in acute and PAC settings. The items are based on current assessment and measurement considerations in each of the PAC settings. The major items collected in the CARE Item Set include those related to the following:

¹ A second phase of data collection, including an additional 60 providers, concluded in December 2010.

- administrative information, such as provider, beneficiary, and payer data;
- pre-admission information, including prior use and premorbid status;
- current medical status items, such as diagnoses, procedures, major treatments, skin integrity, and physiologic factors related to the current admission;
- cognitive status and other interview-based items to measure orientation, risk of delirium, depression, and pain;
- physical factors, including functional status and physical impairments at admission and discharge;
- other factors affecting outcomes, such as frailty or life expectancy; and
- discharge items, including discharge and caregiver information.

The PAC PRD data collection provides the opportunity to identify beneficiaries with CARE data at the start of a PAC episode and to use the CARE data to model episode payments and costs. Not all beneficiaries in the PAC PRD data collection were eligible for inclusion in this analysis. For example, some acute discharge data were collected at the start of an episode, but others were collected at an acute stay that was a readmission or followed other PAC service use later in a beneficiary's episode trajectory. Similarly, some beneficiaries with PAC admission CARE data were at their first site of PAC after an acute hospitalization, and others were in the second or third setting of their episode trajectories. Only beneficiaries with CARE data at the start of a PAC episode were included in the analysis. This approach provided baseline information on beneficiary characteristics to predict subsequent service use, payments, and costs in a PAC episode.

1.2 Risk Adjustment Across Episodes of PAC Using CARE Data

The results of the 2011 episode risk adjustment analyses (Morley et al., 2011) indicate that the standardized CARE variables have strong explanatory power for predicting episode payments and outcomes. Although the first PAC setting explains a substantial portion of the variation in episode payments, similar results were achieved by replacing first PAC setting with CARE variables to predict episode payments. However, including both CARE variables and first PAC setting variables in the models is useful for understanding the magnitude of the differences in episode payments related to the first site of PAC care under the current payment systems. It is not ideal to include a utilization variable such as first site of PAC in a payment model, but the results demonstrated the potential implications of this decision.

The findings from the 2011 work also indicate that the factors that are significant in predicting payments under a longer or shorter episode definition differ in a few important respects. The primary diagnoses that are significant under each episode definition differ, and in some cases the direction of the effect changes. Another key difference when looking at the different episode definitions is that acute hospitalizations in the prior 12 months were significant in the longer episode model and not significant in shorter episode model. This

difference may reflect the fact that the medical characteristics of patients at the start of a PAC episode are most important when predicting payments over a shorter period of time. Past utilization and chronic illness may become more important to consider when predicting payments over a longer period of time.

The results of the work in the 2011 report demonstrate the potential use of claims-based diagnoses and CARE variables in developing an episode-based payment and the significance of setting in predicting overall PAC episode payment. The results reveal important differences in the predictors of payments by first PAC setting and by episode definition, both of which are policy considerations for developing an episode-based payment.

1.3 Goals of Current Work

Although the 2011 work laid an important foundation to understanding the potential to risk adjust PAC episode payments using a standardized assessment instrument such as CARE, several questions emerged over its course. For example, PAC episode payments are based on the current payment systems and the practice patterns that have emerged based on these systems; can a similar risk adjustment model be developed to predict PAC episode costs based on cost report data? Also, given that CARE is not currently mandated, is there a way to use the information learned from the CARE episode risk adjustment analyses to inform the development of episode risk adjustment models based on items collected in the currently mandated assessment instruments? And finally, can we generalize the results from the PAC episode risk adjustment analyses based on the PAC PRD beneficiary sample? The following research questions guide the current study:

1. How well do CARE variables predict PAC episode costs compared with PAC episode payments?
2. Can assessment items from federally mandated assessment instruments collected in PAC settings be crosswalked to CARE items and substituted into models predicting PAC episode costs?
3. Can other items from federally mandated assessment instruments be included in episode risk adjustment models to improve prediction of PAC episode costs?
4. How do the results of models predicting PAC episode costs differ when the models are applied to a national sample rather than to the sample of beneficiaries from the PAC PRD?

In the current project, cost report data were used to create a new dependent variable of PAC episode costs, allowing for comparison of how CARE variables can predict PAC episode costs compared with PAC episode payments. As part of the crosswalking exercise, RTI identified items in the assessment instruments collected in the 2008–2009 study period—the Minimum Data Set Version 2.0 (MDS 2.0) in SNFs; the Inpatient Rehabilitation Facility-

Patient Assessment Instrument (IRF-PAI) in IRFs; and the Outcome Assessment Information Set (OASIS-B) in HHAs—that are analogous to CARE items used in the PAC episode risk adjustment models. Once analogous items were identified, they were substituted into the risk adjustment models in place of the CARE variables. Additional items from the MDS 2.0, IRF-PAI, and OASIS-B were also considered for inclusion in the models. In the final stage of this work, the PAC episode risk adjustment models were applied to the larger Medicare population using a 2008 beneficiary-level PAC episode file based on a 30% national sample of acute hospital-initiated episodes. The analyses provide important information on the potential for extrapolating the episode-based risk adjustment models to the larger Medicare population and on the potential to risk adjust PAC episodes in the absence of uniform assessment data across PAC settings.

The next sections of this report describe the data sources, methods, and key findings from these analyses. **Section 2** describes the analytic samples, the episode definitions explored, and the method for defining the episode costs. **Section 3** describes the CARE Item Set-to-MDS 2.0, IRF-PAI, and OASIS-B crosswalk and the results of the workgroups that informed the crosswalk development. **Section 4** presents the results of multivariate regression models predicting PAC episode payment and PAC episode costs. These models are presented for three episode definitions: (1) 30-day variable-length, (2) 30-day fixed-length, and (3) 60-day fixed-length. **Section 5** discusses the results of these analyses, policy implications, and next steps for this research.

2. DATA AND METHODS

There were two main sources of data for the analyses conducted in this report—the PAC PRD data and a PAC episode file constructed using 2008 national Medicare claims. Each sample is described here, along with the definitions of PAC episodes used in the analyses. This section also describes the approach to determining costs using Medicare cost report data and the specification of the CARE and claims-based independent variables used in the risk adjustment models predicting PAC episode payments and costs.

2.1 Episode Definitions: Initiating Events and Endpoints

As in other work with ASPE on PAC episodes, RTI identified an initiating event for a PAC episode as a short-stay acute hospitalization following a 30-day period without acute or PAC (SNF, IRF, LTCH, or HHA) service use (Gage et al., 2011).

Analyses of three episode definitions are presented in this work:

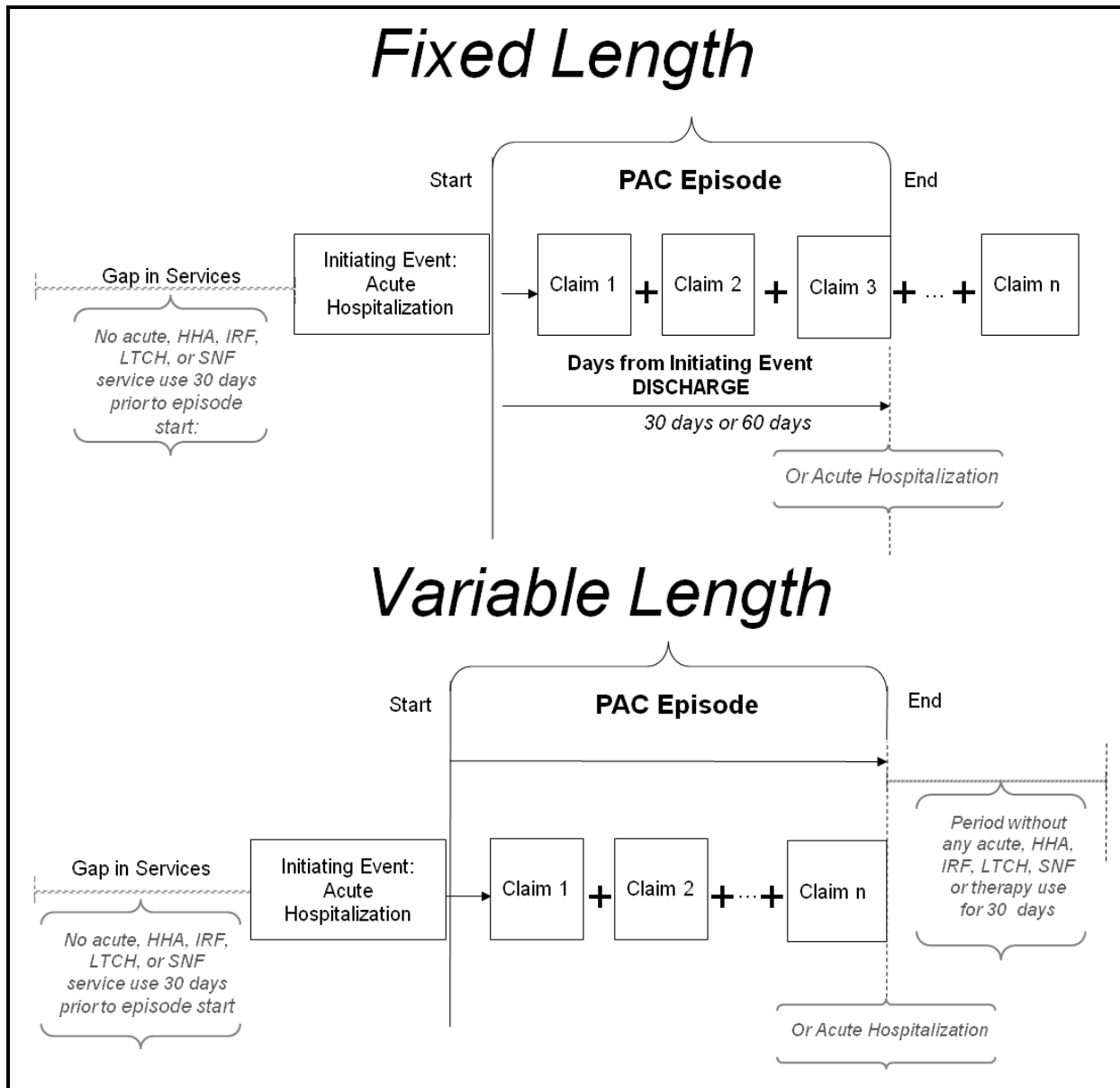
- 30-day variable-length episode: any claim after the initiating acute hospitalization before a 30-day gap in service use
- 30-day fixed-length episode: any claim starting within 30 days after discharge from an initiating acute hospitalization
- 60-day fixed-length episode: any claim starting within 60 days after discharge from an initiating acute hospitalization

These episode definitions were selected because, as found in earlier work conducted for ASPE (Morley, Gage, Smith, Spain, & Ingber, 2009), they vary significantly in mean length of stay and mean payments. The fixed-length episode definitions are also among those being considered in various bundled payment initiatives. The 30-day variable-length episode, defined as all claims that follow an acute hospitalization and occur before a 30-day gap in service use, is another definition that has been explored in earlier RTI work.

Although this definition presents implementation challenges due to the variable length, it more closely resembles a clinical trajectory of service use and therefore analyses of this definition can be informative relative to the fixed-length definitions.

One of the goals of this work is to understand how predictors of payment and costs might vary depending on the PAC episode definition. PAC episodes include acute readmission, IRF, SNF, LTCH, HHA, and therapy claims. Physician claims are not included in these analyses. **Figure 2-1** provides a schematic of the definition of an initiating acute hospitalization and the fixed- and variable-length episode definitions, noting that the episode endpoints are calculated on the basis of the discharge date on the initiating acute hospitalization.

Figure 2-1. PAC Episode Definition Schema



NOTE: HHA, home health agency; IRF, inpatient rehabilitation facility, LTCH, long-term care hospital; PAC, post-acute care; SNF, skilled nursing facility.

2.2 Analytic Samples

2.2.1 PAC PRD Sample

The PAC PRD data were collected from 140 providers in geographically diverse markets. The market areas were chosen to represent both rural and urban populations, as well as areas with different levels of PAC provider supply. In the first phase of data collection,

which concluded at the end of December 2009,² each participating provider collected patient assessment data on 200–250 Medicare beneficiaries over a 9-month data collection period. Participating providers included short-stay acute hospitals, which collected CARE data at discharge, and the four post-acute settings (LTCHs, IRFs, HHAs, and SNFs), which collected CARE data at admission and discharge.

The PAC PRD data collection provided the opportunity to identify beneficiaries with CARE data at the start of a PAC episode and to use the CARE data to model payments and costs during a PAC episode. Not all beneficiaries in the PAC PRD data collection were applicable for inclusion in this analysis. For example, some acute discharge CARE data were collected at the start of an episode, but others were for an acute stay that was a readmission or that followed other PAC service use later in an episode. Similarly, some beneficiaries with PAC admission CARE data were at their first site of PAC after an episode-initiating acute hospitalization, and others were in the second or third setting of their episode trajectories. Only beneficiaries with CARE data at the start of a PAC episode were included in the analysis. This approach provided baseline information on beneficiary characteristics to predict subsequent service use, payments, and costs in a PAC episode.

To identify the subset of beneficiaries with CARE data at the start of an episode of care (either from CARE data at acute hospital discharge or at PAC admission), RTI used Medicare claims data to construct episodes for every beneficiary with a CARE assessment in the PAC PRD data collection. Acute and PAC CARE data were matched to their associated claims to identify beneficiaries with CARE data at discharge from an episode-initiating acute hospitalization or at admission to the first PAC setting after an episode-initiating acute hospitalization. **Tables 2-1a** and **2-1b** describe each of the PAC PRD analytic samples in the study.

Table 2-1a. Sample Sizes for PAC PRD–Based Episode Risk Adjustment Analyses

CARE data at episode-initiating acute hospitalization discharge	
First PAC setting	N
First PAC = LTCH	25
First PAC = IRF	130
First PAC = SNF	312
First PAC = HHA	434
Total	901

² A second phase of data collection, including an additional 60 providers, concluded in December 2010; however, these additional 60 providers are not included in the analysis presented in this report.

Table 2-1b. Sample Sizes for PAC PRD–Based Episode Risk Adjustment Analyses

CARE data at admission to first PAC setting after episode-initiating hospitalization	
First PAC setting	N
First PAC = LTCH	1,243
First PAC = IRF	2,977
First PAC = SNF	2,382
First PAC = HHA	1,397
Total	7,999

NOTE: CARE, Continuity Assessment Record and Evaluation; HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

SOURCE: RTI analysis of Medicare claims (MMOR078).

In prior analyses in other projects, RTI has seen that beneficiaries discharged from an acute hospital to an institutional PAC setting are most often transferred directly to the PAC setting, and beneficiaries discharged to HHAs most often initiate care within 1 week. For beneficiaries initiating their episodes of care in acute hospitals but with CARE data available in the first PAC setting after acute hospital discharge, RTI examined the number of days between discharge from the acute hospital and admission to the first PAC setting and found that, in most cases, the gap between services was 0 or 1 day for beneficiaries discharged to inpatient PAC providers and 5 days or fewer for beneficiaries discharged to HHA. This gap analysis confirms that we have baseline information for the purposes of risk adjusting across a PAC episode for these analyses.

2.2.2 Sample Weights

RTI developed sample weights to use in the multivariate models to account for intentional oversampling of the LTCHs and IRFs in the PAC PRD study design. Sample weights correct for differences between a sample and the population it represents. Because of the oversampling, the proportion of beneficiaries in the PAC PRD sample receiving PAC services at an LTCH or IRF exceeded that in the population. **Table 2-2** shows that 14% of the PAC PRD sample was discharged from an acute hospital to LTCH, compared with 2% nationally, according to earlier work by RTI and ASPE (Gage et al., 2011). Similarly, a larger proportion of the sample, 35%, was discharged from an acute hospital to an IRF, compared with 11% nationally.

Table 2-2. Sample Weights for PAC PRD Sample Analysis

First PAC Setting	% in PAC PRD Sample	% in Medicare Population	Weight
LTCH	14	2	0.13991
IRF	35	11	0.30837
SNF	30	47	1.54520
HHA	21	40	1.96709
TOTAL	100	100	—

NOTE: HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

SOURCE: RTI analysis of 2008 Medicare claims (from ASPE Expanded Post-Acute Care Episodes Analytic File project; M3MM143).

Sample weights were applied to adjust the sample proportions for each setting so that they are equal to that in the population. The weights were calculated as the proportion of the population that received care in each setting divided by the proportion of the sample that received care in that setting:

$$w_i = \frac{\left(\frac{N_{p,i}}{\sum_i N_{p,i}} \right)}{\left(\frac{N_{s,i}}{\sum_i N_{s,i}} \right)}$$

where i indicates the PAC setting (LTCH, IRF, SNF, or HHA), p indicates population, and s indicates sample. Each observation was assigned a weight based on the type of PAC setting. For example, each observation with a first PAC setting of LTCH has the same weight, and so on. Table 2-2 shows the values of the sample weights. When the sample weights are applied, the proportion of episodes with each first PAC setting in the weighted sample is equal to that in the population.

2.2.3 2008 National Sample

The second data source for this project was an episode file constructed using 2008 national Medicare claims for 30% of beneficiaries with acute hospital-initiated episodes. This file was constructed using the same episode definitions (including definition of initiating event and episode endpoints) as were used for the PAC PRD data. The file included 659,549 acute hospital-initiated episodes.

2.3 Dependent Variable Specification—PAC Episode Costs

This section describes the approach that RTI used to calculate costs for episodes in the PAC PRD sample. Note that a similar method was used for the national sample. The approach to estimating costs varied by provider type. We used two primary data sources to calculate

costs, the Provider Specific File (PSF) and the Medicare Cost Report data. The PSF was used for acute hospitals, IRFs, and LTCHs. The Medicare Cost Report data were used for HHAs and SNFs. Claim-level costs were calculated first and then summed to the episode level for use in our regression analyses.

2.3.1 Calculating Costs for Acute Hospitals, IRFs, and LTCHs

For acute hospitals, IRFs, and LTCHs, we identified the operating cost-to-charge ratio (CCR) for fiscal year (FY) 2008 from the PSF. If a provider matched to more than one PSF record in FY2008, we identified the record that covered the greatest number of days in the year. If no PSF record was available during FY2008, we identified the closest PSF record within 2 years. Costs for IRF units and hospitals-within-hospitals were not calculated separately, as the distributions of CCRs were similar to those of the freestanding facilities.

To control for the effect of outliers (values that appear extreme) within each provider type, the CCRs were Winsorized (capped). For example, when Winsorizing at the 99th and 1st percentiles, we set values higher than the 99th percentile equal to the 99th percentile value and values lower than the 1st percentile equal to the 1st percentile value. We Winsorized at the 99th and 1st percentiles for acute hospitals and at the 95th and 5th percentiles for IRFs. For LTCHs, we Winsorized at the second highest and second lowest values among LTCH providers, since the number of LTCHs was small (76).

For providers that did not have cost report data (either no data were available or the data available fell outside of our date ranges), we imputed the CCR to be the median of the CCRs for that provider type before Winsorizing. We imputed values for 8% (48) of acute hospitals that did not match the PSF with the median for acute hospitals. All IRFs and LTCHs included in PAC episodes for the PAC PRD sample matched to the PSF data, so imputation was not necessary. Distributions for the CCRs for acute hospitals, IRFs, and LTCHs before and after Winsorizing and imputation are shown in **Tables 2-3** through **2-5**, respectively.

To calculate claim costs, we multiplied the CCR by claim charges. The claim costs were then summed to the episode level for use in our regression analyses.

Table 2-3. Acute Hospitals: Cost-to-Charge Ratio Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Before Imputation and Winsorizing	After Imputation and Winsorizing
Number of observations	554	602
Mean	0.361	0.358
Std deviation	0.131	0.121
Minimum	0.096	0.143
1st percentile	0.132	0.143
25th percentile	0.266	0.276
50th percentile (median)	0.346	0.346
75th percentile	0.440	0.427
99th percentile	0.726	0.703
Maximum	1.000	0.703

Table 2-4. Inpatient Rehabilitation Facility Providers (freestanding and hospital-based): Cost-to-Charge Ratio Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Before Imputation and Winsorizing	After Imputation and Winsorizing
Number of observations	202	202
Mean	0.544	0.542
Std deviation	0.162	0.140
Minimum	0.026	0.317
5th percentile	0.317	0.317
25th percentile	0.449	0.449
50th percentile (median)	0.520	0.520
75th percentile	0.630	0.630
95th percentile	0.829	0.829
Maximum	1.078	0.829

Table 2-5. Long-Term Care Hospitals (freestanding and Hospital-within-Hospitals): Cost-to-Charge Ratio Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Before Imputation and Winsorizing	After Imputation and Winsorizing
Number of observations	76	76
Mean	0.398	0.398
Std deviation	0.113	0.111
Minimum	0.188	0.252
1st percentile	0.188	0.252
25th percentile	0.313	0.313
50th percentile (median)	0.378	0.378
75th percentile	0.464	0.464
99th percentile	0.707	0.703
Maximum	0.707	0.703

2.3.2 Calculating Costs for HHAs

Freestanding HHA costs were calculated using the HHA cost reports, and hospital-based HHA costs were calculated using the HHA subprovider worksheets of the hospital cost reports. For the HHAs, we calculated average cost per visit type from the cost reports for FY2008. For a small number of HHA providers that did not match to the 2008 cost report data, we used data from the cost report with the closest date to 2008 from FY2007 or FY2009. We included costs for the following visit types: (1) skilled nursing, (2) physical therapy, (3) occupational therapy, (4) speech pathology, (5) medical social services, and (6) home health aide services. In addition, we calculated an average cost per Title 18 skilled nursing visit for medical supplies.

We Winsorized values separately for the freestanding HHAs and hospital-based HHAs. The rationale for this decision is that the hospital-based HHAs have higher average costs than the freestanding HHAs. To control for the effect of outliers, Winsorizing was performed at the 5th and 95th percentiles for all visit types, except for medical social services, which were Winsorized at the 10th and 90th percentiles because of the distributions we observed in the data. For HHAs that had matching cost report data, but did not have data for a given visit type, we imputed a cost relative to the provider's average percentage of the median across nonmissing visit types after Winsorizing. For example, if an HHA provider had missing values for medical social service visits and the costs for the other five visit types averaged 150% of the PAC PRD sample median, then the imputed value for the medical social service costs was estimated at 150% of the overall median for that visit type. For both the freestanding and hospital-based HHAs, if the average cost of medical supplies per

skilled nursing visit was missing, we set the value to zero. Note that imputed values were used in the cost calculations only if the imputed visit type appeared on a claim. For freestanding and hospital-based HHAs that did not have matching cost report data, we imputed the respective sample median for each visit type.

For freestanding HHAs, we imputed the average cost per visit for skilled nursing and physical therapy for 32 HHAs, occupational therapy for 77 HHAs, speech pathology for 145 HHAs, medical social services for 172 HHAs, and home health aide services for 39 HHAs. For hospital-based HHAs, we imputed the average cost per visit for skilled nursing for 7 HHAs, physical therapy for 8 HHAs, occupational therapy for 20 HHAs, speech pathology for 23 HHAs, medical social services for 33 HHAs, and home health aide services for 10 HHAs. For both the freestanding and hospital-based HHAs, if the average cost of medical supplies per skilled nursing visit was missing, we set the value to zero. We did not include these zeros in the distributions below. The distributions of costs per visit by type before and after Winsorizing and imputing are shown in **Tables 2-6** and **2-7** for freestanding and hospital-based HHAs, respectively.

Thirty-three HHAs did not match to the cost reports. Of these, 6 were SNF-based, 4 were hospital-based, and 23 could not be determined. We did not impute values for the SNF-based HHAs both because we did not have sufficient information on these types of providers and because they were very few. We also did not impute values for the hospital-based HHAs because there were too few to know if the PAC PRD sample median was a good approximation. We did not impute values for the remaining 23 HHAs that we were not able to assign as freestanding or hospital-based because of the large difference in costs between freestanding and hospital-based HHAs.

To calculate claim costs, we multiplied the average cost per visit by the number of visits and then summed by visit type. The claim costs were then summed to the episode level for use in our regression analyses.

2.3.3 Calculating Costs for SNFs

The costs for freestanding SNFs were calculated using the SNF cost reports, and the costs for hospital-based SNFs were calculated using the subprovider worksheets of the hospital cost report associated with the SNF. There are two types of SNF costs, routine and ancillary. These costs were calculated separately. Routine costs per day were calculated from the cost reports. The cost reports do not provide routine costs per day for Medicare patients separate from all patients. However, the Medicare Payment Advisory Commission (MedPAC) has reported that Medicare patients use more nursing services in SNFs than non-Medicare patients.³ Routine costs were adjusted using the same method used by MedPAC,

³ Report to the Congress, Medicare Payment Policy, MedPAC, March 2010

Table 2-6. Freestanding Home Health Agency: Average Cost per Visit Type Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Skilled Nursing —Before	Skilled Nursing —After	PT —Before	PT —After	OT —Before	OT —After	Speech Pathology —Before	Speech Pathology —After	Medical Social Services —Before	Medical Social Services —After	Home Health Aide Services —Before	Home Health Aide Services —After	Medical Supplies/ Skilled Nursing Visit —Before	Medical Supplies/ Skilled Nursing Visit —After
N	918	950	918	950	873	950	805	950	778	950	911	950	683	683
Mean	145.99	141.02	157.96	153.93	164.88	152.98	181.89	170.08	285.66	213.88	79.24	65.28	3.79	3.39
Std dev	74.04	47.06	65.16	45.99	193.32	52.59	186.13	72.72	522.30	102.93	160.67	32.36	5.18	3.51
Minimum	40.88	72.22	2.17	88.33	1.59	75.93	0.33	73.38	13.00	103.45	4.52	26.83	0.00	0.06
P5	72.22	73.05	88.33	88.53	75.57	77.75	71.00	74.26	80.30	103.45	26.83	27.19	0.06	0.06
P25	105.43	106.46	120.28	121.24	115.40	116.41	116.15	120.80	135.33	136.96	42.94	43.45	0.69	0.69
Median	132.84	132.84	145.15	145.15	143.46	144.13	149.85	152.24	178.46	179.86	56.99	57.09	2.15	2.15
P75	170.56	168.97	176.25	174.53	178.67	178.67	196.14	199.66	266.59	263.08	76.64	76.14	4.94	4.94
P95	249.77	248.94	270.77	267.91	273.68	280.02	335.85	349.78	658.91	441.32	156.79	151.23	13.11	13.11
Maximum	1,164.85	249.77	795.81	270.77	4807.14	283.49	2928.00	358.33	7,044.00	441.32	3,698.67	156.79	48.78	13.11

NOTE: 10th and 90th percentiles are not reported in table. OT, occupational therapy; PT, physical therapy.

Table 2-7. Hospital-Based Home Health Agency: Average Cost per Visit Type Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Skilled Nursing –Before	Skilled Nursing –After	PT –Before	PT –After	OT –Before	OT –After	Speech Pathology –Before	Speech Pathology –After	Medical Social Services –Before	Medical Social Services –After	Home Health Aide Services –Before	Home Health Aide Services –After	Medical Supplies/ Skilled Nursing Visit –Before	Medical Supplies/ Skilled Nursing Visit –After
N	145	152	144	152	132	152	129	152	119	152	142	152	105	105
Mean	212.94	210.04	165.22	160.40	175.68	166.67	223.53	196.35	1,203.35	313.82	101.84	89.68	17.68	16.26
Std dev	83.30	73.55	74.83	52.20	104.73	63.39	285.53	109.24	4,464.00	255.96	144.61	49.70	19.47	14.03
Minimum	82.03	101.04	33.98	84.66	0.42	79.36	16.33	48.77	2.25	94.00	14.39	32.78	0.03	0.88
P5	101.04	101.04	84.66	84.66	79.36	79.36	44.28	48.77	51.88	94.00	32.78	32.78	0.88	0.88
P25	158.54	162.85	122.45	123.94	116.39	119.22	121.03	123.79	147.51	153.27	55.58	56.66	6.07	6.07
Median	199.68	199.68	153.17	152.36	155.38	155.40	175.89	175.19	235.17	219.90	77.18	77.54	11.80	11.80
P75	256.62	256.32	184.97	181.40	197.75	197.36	239.33	242.20	392.62	353.96	104.57	103.80	21.37	21.37
P95	375.92	375.92	274.49	274.49	335.11	316.76	521.79	508.12	7,251.08	965.20	217.44	229.99	52.58	52.58
Maximum	482.77	375.92	609.40	274.49	824.86	316.76	2946.14	508.12	38,848.33	965.20	1,630.38	229.99	128.46	52.58

NOTE: 10th and 90th percentiles are not reported in table. OT, occupational therapy; PT, physical therapy.

which sets the Medicare nursing component at 1.346 times the non-Medicare nursing component and assumes that nursing is about 40% of the cost per day. Routine costs were adjusted using the following formula:

$$\text{Adjusted Routine Cost} = w * C + (1-w) * (0.6 * C + 0.4 * 1.346 * C)$$

where w is the proportion of Medicare-covered SNF days (Medicare-covered SNF days/total SNF days) and C is the total cost for SNF divided by total days for SNF.

We Winsorized and imputed routine costs per day for freestanding SNFs and hospital-based SNFs separately because of the large difference in costs between freestanding and hospital-based SNFs. Routine costs per day were Winsorized at the 1st and 99th percentiles for freestanding and hospital-based SNFs. Ten SNFs (fewer than 1%) did not match to the cost report data. Because we were not able to reliably determine whether these were freestanding or hospital-based SNFs, these costs were set to “missing.” However, for another 11 freestanding SNFs without matching cost reports, we imputed the routine cost per day to be the median of the routine cost per day after Winsorizing for freestanding SNFs with cost reports. We did not impute the adjusted cost per day for any hospital-based SNFs because we were able to identify matching cost reports for these.

Ancillary costs were calculated using a CCR ratio. For freestanding SNFs, we used the lines from the SNF cost report for medical supplies charged, drugs charged to patients, radiology, laboratory, oxygen/inhalation therapy, physical therapy, occupational therapy, speech therapy, electrocardiology, support surfaces, and other ancillary. For hospital-based SNFs, we used the lines from the hospital cost report for medical supplies charged, drugs charged to patients, radiology, laboratory, physical therapy, occupational therapy, speech therapy, and electrocardiology.

We Winsorized CCR ratios separately for freestanding SNFs and hospital-based SNFs. The ancillary CCR ratios for freestanding SNFs were Winsorized at the 5th and 95th percentiles, except for oxygen therapy, which was Winsorized at the 10th and 90th percentiles. For hospital-based SNFs, the ancillary CCR ratios were Winsorized at the 1st and 99th percentiles, except for medical supplies charged, which was Winsorized at the 5th and 95th percentiles.

For SNFs without a cost report or with a matching cost report and missing values for one of the ancillary costs, we either set the value to zero under the assumption that the SNF did not provide those ancillary services (typically when 60% or more of the SNFs had missing information for a specific CCR ratio) or imputed the median. **Tables 2-8** and **2-9** detail how each CCR ratio was Winsorized and imputed for the freestanding and hospital-based SNFs, respectively. The distributions of the CCR ratios before and after Winsorizing and imputing are shown in **Tables 2-10a, 2-10b, 2-11a, and 2-11b** for freestanding and hospital-based SNFs, respectively. We did not include the zeros that we set for missing values in the distributions shown in the tables.

Table 2-8. Freestanding Skilled Nursing Facility Ancillary Cost to Charge Winsorizing and Imputation

Ancillary Cost Type	Winsorized at	Imputation/ Set to Zero for Missing Values	Number Imputed or Set to Zero	Percent Imputed or Set to Zero
Radiology	5th & 95th percentiles	Imputed at median	121	9.6
Laboratory	5th & 95th percentiles	Imputed at median	116	9.2
Oxygen/inhalation therapy	10th & 90th percentiles	Set to zero	955	75.3
Physical therapy	5th & 95th percentiles	Imputed at median	13	1.0
Occupational therapy	5th & 95th percentiles	Imputed at median	28	2.2
Speech therapy	5th & 95th percentiles	Imputed at median	31	2.5
Electrocardiology	5th & 95th percentiles	Set to zero	1,221	96.2
Medical supplies charged	5th & 95th percentiles	Imputed at median	165	13.1
Drugs charged to patients	5th & 95th percentiles	Imputed at median	25	2.0
Support surfaces	5th & 95th percentiles	Set to zero	1,022	80.5
Other ancillary	5th & 95th percentiles	Set to zero	1,035	81.6

Table 2-9. Hospital-based Skilled Nursing Facility Ancillary Cost to Charge Winsorizing and Imputation

Ancillary Cost Type	Winsorized at	Imputation/ Set to Zero for Missing Values	Number Imputed or Set to Zero	Percent Imputed or Set to Zero
Radiology	1st & 99th percentiles	N/A	N/A	N/A
Laboratory	1st & 99th percentiles	N/A	N/A	N/A
Physical therapy	1st & 99th percentiles	N/A	N/A	N/A
Occupational therapy	1st & 99th percentiles	Imputed at median	16	27.1
Speech therapy	1st & 99th percentiles	Imputed at median	16	27.1
Electrocardiology	1st & 99th percentiles	Imputed at median	12	20.3
Medical supplies charged	5th & 95th percentiles	Imputed at median	4	6.8
Drugs charged to patients	1st & 99th percentiles	N/A	N/A	N/A

NOTE: N/A = not applicable because of no missing values.

Table 2-10a. Freestanding Skilled Nursing Facilities: Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Routine Cost Per Day—Before	Routine Cost Per Day—After	Radiology CCR—Before	Radiology CCR—After	Laboratory CCR—Before	Laboratory CCR—After	Oxygen CCR—Before	Oxygen CCR—After	PT CCR—Before	PT CCR—After	OT CCR—Before	OT CCR—After
N	1,249	1,260	1,139	1,260	1,144	1,260	305	305	1,247	1,260	1,232	1,260
Mean	208.52	202.02	1.41	1.00	41.73	0.83	6.19	1.31	0.72	0.69	0.62	0.60
Std dev	202.46	48.80	5.19	0.60	1376.80	0.47	51.33	1.23	0.37	0.24	0.32	0.20
Minimum	67.70	115.04	0.00	0.22	0.02	0.10	0.00	0.22	0.05	0.34	0.03	0.29
P5	133.14	133.20	0.22	0.23	0.10	0.11	0.13	0.22	0.34	0.34	0.29	0.29
P25	166.59	166.84	0.57	0.59	0.47	0.51	0.52	0.52	0.51	0.51	0.44	0.45
Median	198.08	198.08	0.86	0.86	0.77	0.77	0.87	0.87	0.66	0.66	0.57	0.57
P75	231.49	231.43	1.26	1.21	1.16	1.11	1.38	1.38	0.84	0.83	0.72	0.72
P95	290.99	290.68	2.66	2.55	1.98	1.93	7.72	4.16	1.24	1.24	1.07	1.05
Maximum	7,078.11	376.48	148.45	2.66	46,568.67	1.98	864.00	4.16	5.38	1.24	5.40	1.07

Table 2-10b. Freestanding Skilled Nursing Facilities: Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Speech CCR—Before	Speech CCR—After	Electro-cardiology CCR—Before	Electro-cardiology CCR—After	Medical Supplies CCR—Before	Medical Supplies CCR—After	Drugs CCR—Before	Drugs CCR—After	Support Surfaces—Before	Support Surfaces—After	Other Ancillary CCR—Before	Other Ancillary CCR—After
N	1,229	1,260	39	39	1,095	1,260	1,235	1,260	238	238	225	225
Mean	0.83	0.71	11.57	1.17	14.05	2.13	0.88	0.85	1.58	1.12	31.85	3.51
Std dev	1.68	0.32	65.61	1.30	176.20	3.44	0.63	0.28	3.47	1.21	329.09	7.49
Minimum	0.05	0.27	0.00	0.01	0.01	0.21	0.03	0.41	0.01	0.07	0.00	0.11
P5	0.27	0.27	0.01	0.01	0.21	0.24	0.41	0.41	0.07	0.07	0.11	0.11
P25	0.48	0.49	0.25	0.25	0.58	0.61	0.61	0.61	0.46	0.46	0.53	0.53
Median	0.66	0.66	0.79	0.79	0.95	0.95	0.85	0.85	0.72	0.72	1.00	1.00
P75	0.88	0.87	1.45	1.45	1.79	1.54	1.04	1.03	1.25	1.25	2.05	2.06
P95	1.47	1.46	5.35	5.35	15.30	12.01	1.43	1.42	5.24	5.24	31.51	31.51
Maximum	50.57	1.47	410.74	5.35	4,429.46	15.30	17.97	1.43	33.17	5.24	4,845.50	31.51

NOTE: 1st and 99th and 10th and 90th percentiles are not reported in table. CCR, cost to charge; PT, physical therapy; OT, occupational therapy.

Table 2-11a. Hospital-Based Skilled Nursing Facilities: Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Routine Cost Per Day—Before	Routine Cost Per Day—After	Radiology CCR—Before	Radiology CCR—After	Laboratory CCR—Before	Laboratory CCR—Before	PT CCR—Before	PT CCR—After	OT CCR—Before	OT CCR—After
N	59	59	59	59	59	59	59	59	43	59
Mean	536.48	536.48	0.27	0.27	0.25	0.25	0.48	0.48	0.38	0.37
Std dev	231.59	231.59	0.21	0.21	0.26	0.26	0.21	0.21	0.21	0.18
Minimum	191.23	191.23	0.05	0.05	0.07	0.07	0.25	0.25	0.03	0.03
P1	191.23	191.23	0.05	0.05	0.07	0.07	0.25	0.25	0.03	0.03
P25	372.05	372.05	0.13	0.13	0.12	0.12	0.34	0.34	0.27	0.29
Median	514.87	514.87	0.20	0.20	0.18	0.18	0.42	0.42	0.33	0.33
P75	664.60	664.60	0.34	0.34	0.24	0.24	0.57	0.57	0.47	0.43
P99	1,107.25	1,107.25	0.97	0.97	1.67	1.67	1.24	1.24	1.15	1.15
Maximum	1,107.25	1,107.25	0.97	0.97	1.67	1.67	1.24	1.24	1.15	1.15

Table 2-11b. Hospital Based Skilled Nursing Facilities: Summary Statistics Before and After Imputation and Winsorizing

Summary Statistic	Speech—Before	Speech—After	Electro-cardiology CCR—Before	Electro-cardiology CCR—After	Medical Supplies CCR—Before	Medical Supplies CCR—After	Drugs CCR—Before	Drugs CCR—After
N	43	59	47	59	55	59	59	59
Mean	0.48	0.46	0.22	0.20	3.65	0.50	0.31	0.31
Std dev	0.24	0.20	0.29	0.26	22.93	0.32	0.21	0.21
Minimum	0.03	0.03	0.01	0.01	0.06	0.13	0.09	0.09
P1	0.03	0.03	0.01	0.01	0.06	0.13	0.09	0.09
P25	0.34	0.36	0.08	0.09	0.26	0.30	0.16	0.16
Median	0.41	0.41	0.14	0.14	0.40	0.40	0.25	0.25
P75	0.57	0.51	0.24	0.19	0.64	0.61	0.37	0.37
P99	1.19	1.19	1.62	1.62	170.49	1.41	0.93	0.93
Maximum	1.19	1.19	1.62	1.62	170.49	1.41	0.93	0.93

NOTE: Because of small numbers, Winsorizing at the 1st and 99th percentiles did not necessarily affect the values reported; 5th and 95th percentiles are not reported in table. CCR, cost to charge; PT, physical therapy; OT, occupational therapy.

Costs for SNFs were calculated as the routine cost per day multiplied by the number of days, plus the ancillary CCR multiplied by the ancillary charges for the corresponding revenue centers. To select the corresponding revenue centers, we looked to the Medicare Provider Analysis and Review (MedPAR) documentation and selected the revenue centers that are mapped to the MedPAR charge centers.⁴ SNF-swing beds were treated separately from other SNF stays. To calculate the costs for a swing-bed stay, we used the facility's (e.g., acute hospital) CCR multiplied by the charges for the stay.

2.3.4 Calculating PAC Episode Costs

PAC episode costs were calculated by summing all PAC costs and acute readmission costs in an episode. In addition to SNF, IRF, LTCH, HHA, and acute readmission costs, we also included outpatient therapy costs (in outpatient departments and independent therapists' offices). Therapy costs were set equal to the therapy payment amount because therapy claims are paid based on a fee schedule and the costs are not readily available from cost reports.

If any cost component was missing in an episode, the PAC cost for that episode was set to "missing." For example, if an episode included a SNF stay, an IRF stay, and a readmission but costs could only be calculated for the SNF stay and the readmission, the PAC episode cost was set to missing. Fewer than 2% of the PAC PRD sample had PAC episode costs set to missing for this reason. Not setting the PAC cost to missing would understate the actual cost of the episode. Once the PAC episode costs were calculated, we Winsorized values for PAC episode cost at the 99th percentile to limit the effect of a few outlier cases on the results of the multivariate analysis. **Table 2-12** presents the distribution of PAC episode costs alongside the PAC episode payments for the 30-day fixed-length, 60-day fixed-length, and 30-day variable-length episodes. Note that PAC episode payments were standardized to remove payments related to wage adjustments, indirect medical education, and disproportionate share hospital payments by using base rate payments and case-mix weights published in the *Federal Register*. (For more detail on the approach for standardizing payment amounts, please see Morley et al., 2011.)

In a large proportion of episodes (just over 40%), the PAC episode costs were found to be greater than the payments. Most of these instances appeared to be driven by long facility stays, leading to very large charges. When these charges were converted to costs using a CCR, the costs were also large.

⁴ For radiology we used revenue centers 032x; for laboratory we used revenue centers 030x and 031x; for intravenous therapy we used revenue centers 026x; for oxygen/inhalation therapy we used revenue centers 041x; for physical therapy we used revenue centers 042x; for occupational therapy we used revenue centers 043x; for speech therapy we used revenue centers 044x; for electrocardiology we used revenue centers 073x and 0482; for medical supplies charged we used revenue centers 027x and 062x; for drugs charged to patients we used revenue centers 025x and 063x; for support surfaces we used revenue centers 029x and 0946; and for other ancillary we used revenue centers 0483, 0220, 0480, 0489, 0540, 0750, 0761, 0762, 0771, 0920, 0921, 0940, 0947, and 0949. Note that for other ancillary we included only revenue center codes that appeared in the claims and appeared to be ancillary (e.g., we did not include revenue centers for room and board).

Table 2-12. PAC Episode Payments and Costs—Summary Statistics for PAC PRD Sample

Episode Definition	N	Mean	P25	Median	P75
PAC episode payments					
30-day variable	8,900	\$32,324	\$9,140	\$19,779	\$40,859
30-day fixed	8,900	\$22,155	\$7,713	\$16,546	\$28,936
60-day fixed	8,900	\$25,676	\$8,517	\$18,066	\$33,342
PAC episode costs					
30-day variable	8,724	\$34,867	\$7,420	\$17,997	\$42,510
30-day fixed	8,773	\$22,069	\$6,207	\$14,075	\$28,778
60-day fixed	8,744	\$26,528	\$6,912	\$15,966	\$33,487

NOTE: P25 and P75, 25th and 75th percentiles; PAC, post-acute care; PRD, Payment Reform Demonstration.

SOURCE: ASPERISK2_174, MMOR064.

2.4 Independent Variable Selection and Specification

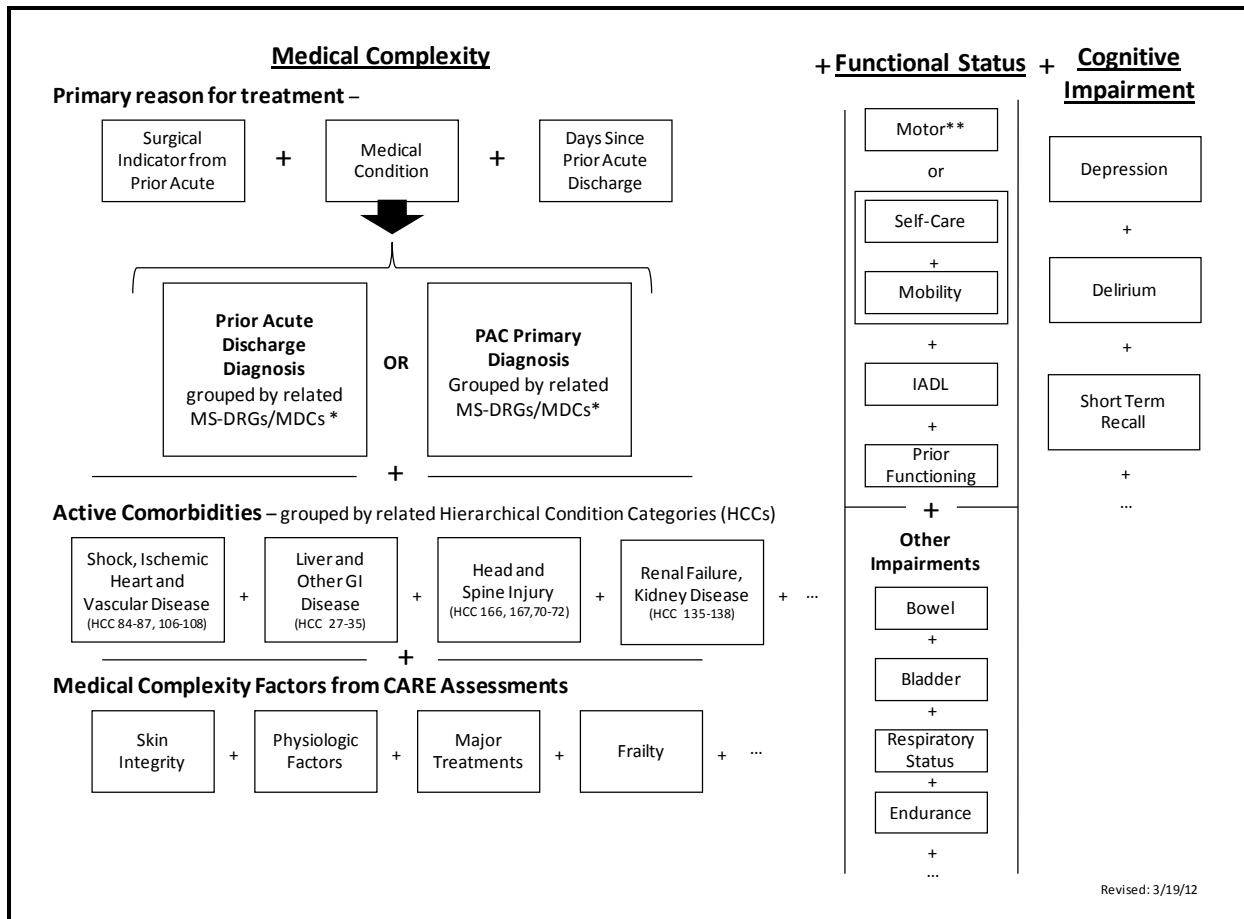
As the starting point for the analyses conducted in this project, RTI used the CARE variables to develop risk-adjusted payment and cost models for acute hospital-initiated episodes for each episode definition. Beneficiary characteristics used in the risk adjustment models included CARE variables collected at the start of a beneficiary's PAC episode.

The CARE Item Set is composed of items that are significant in predicting resource utilization and costs associated with PAC services. The items target individual patient characteristics that explain patient severity or the resources needed to treat the patient. Some key items in CARE for predicting costs and resource utilization include

- medical diagnoses (i.e., primary and comorbid),
- major treatments,
- pressure ulcers and wounds,
- cognitive factors,
- impairment items (e.g., bowel and bladder deficits, swallowing deficits), and
- functional status items (e.g., self-care, functional mobility).

The CARE items were developed to provide standardized versions of the items currently used or needed to predict payments or outcomes in the PAC settings. In work on the CMS PAC PRD, RTI developed a conceptual framework for understanding how CARE items predict resource use and outcomes (**Figure 2-2**). Although this framework has been developed to predict intensity in a single setting of care rather than across an episode, it serves as a useful starting point for predicting episode payments and costs, given that many of the same variables are likely to be significant across an episode of care.

Figure 2-2. CARE Case Mix Classification Schema



The conceptual framework has three major components: medical complexity, functional level, and cognitive impairment. The medical complexity component encompasses medical conditions, including reason for admission, active comorbidities, major treatments, and skin integrity. The functional status component includes a measure of a beneficiary’s need for assistance for mobility, self-care, and instrumental activities of daily living, as well as a measure of other impairments (i.e., bowel and bladder). The cognitive impairment component includes measures of depression, delirium, communication disorder, and short-term recall. More detailed discussion of the independent variables used in the multivariate models is presented in the next sections.

2.4.1 Model Variable Specification

In this section, we discuss the variable selection and specification in greater detail. The independent variable selection for the ASPE risk adjustment analyses was informed by an analytic workgroup including clinicians and experts in risk adjustment internal to CMS and the Department of Health and Human Services. This workgroup provided feedback on the

analytic framework and independent variables included in the models. The variable selection and specification are discussed below, and descriptive statistics on the independent variables are also included in **Table 2-13**. Independent variables in the models included the following CARE and claims-based variables. Note that MDS 2.0, OASIS-B, and IRF-PAI variables used in risk adjustment models are discussed further in **Section 3**.

- Demographic characteristics and premorbid factors
 - Age group (<65, 65–74, 75–84, 85+)
 - Gender (male, female)
 - Race (black, non-black)
 - Medicaid as current payment source (either fee for service or HMO)
- Prior acute hospitalization in last 12 months (0, 1, or ≥ 2)
- Number of intensive care unit stay days and number of intensive care unit stay days squared (during the episode-initiating acute hospitalization)
- Current medical complexity
 - Etiologic or primary condition: Condition was obtained from the claim of the episode-initiating acute hospitalization. In addition to the primary condition variable, an indicator for whether condition was medical or surgical was included.
 - Comorbidities as measured by modified hierarchical condition categories (HCCs) based on the claim associated with the CARE assessment. Multiple flags indicate the presence of a comorbid condition that is not redundant with the primary condition. Examples include infection, cancer, diabetes, spinal injury, bacterial pneumonia, chronic renal failure, and respiratory conditions.
 - Severe pressure ulcer present: Indicates whether the patient had a severe pressure ulcer (defined as having a stage 3, stage 4, or unstageable ulcer or a stage 2 ulcer known to be present for more than 1 month) (yes/no).
 - Presence of a major wound: Indicates whether the patient had a major wound (yes/no). This category includes both delayed healing of surgical wounds and trauma-related wounds, such as burns, diabetic foot ulcers, or vascular ulcers (arterial or venous).
 - Turning surfaces—at least one not intact: Indicates whether the patient had at least one turning surface not intact. Turning surfaces include right or left hips, back or buttocks, or other turning surface (yes/no).
 - Major treatments: Indicates whether the patient received any of a set of selected major treatments at the start of the PAC episode. The specific major treatments included in the models were hemodialysis, total parenteral nutrition, central line management, and mechanical ventilation (weaning and nonweaning). Major treatments were included in the model as a series of yes/no indicators.

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall, and by First PAC Setting

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Age										
64 years and under	889	10.0	301	9.7	143	5.3	214	11.7	231	18.2
65–74	2,569	28.9	986	31.7	545	20.2	580	31.7	458	36.1
75–84	3,350	37.6	1,192	38.4	1,068	39.6	680	37.1	410	32.3
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Race/ethnicity black or African American										
No	8,291	93.2	2,880	92.7	2,584	95.9	1,653	90.3	1,174	92.6
Yes	609	6.8	227	7.3	110	4.1	178	9.7	94	7.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Gender										
Female	5,270	59.2	1,786	57.5	1,850	68.7	1,030	56.3	604	47.6
Male	3,630	40.8	1,321	42.5	844	31.3	801	43.8	664	52.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Medicaid is a current payment source										
No	8,280	93.0	2,894	93.1	2,577	95.7	1,706	93.2	1,103	87.0
Yes	620	7.0	213	6.9	117	4.3	125	6.8	165	13.0
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Primary medical diagnosis										
Orthopedic	2,887	32.4	1,239	39.9	1,150	42.7	420	22.9	78	6.3
Neurologic	1,399	15.7	984	31.7	202	7.5	129	7.1	84	6.6
Respiratory	1,328	14.9	179	5.8	257	9.5	231	12.6	661	52.1
Cardiovascular	1,352	15.2	325	10.5	366	13.6	509	27.8	152	12.0
Integumentary	186	2.1	22	0.7	79	2.9	58	3.2	27	2.1
Endocrine	148	1.7	26	0.8	63	2.3	45	2.5	14	1.1
Kidney and urinary	296	3.3	52	1.7	150	5.6	76	4.2	18	1.4
Infections	282	3.2	56	1.8	97	3.6	52	2.8	77	6.1
Transplant	12	0.1	2	0.1	1	0.0	6	0.3	3	0.2
Gastrointestinal and hepatobiliary	578	6.5	87	2.8	209	7.8	187	10.2	95	7.5

(continued)

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Hematologic	77	0.9	17	0.6	22	0.8	30	1.6	8	0.6.6
Other	355	4.0	118	3.8	98	3.6	88	4.8	51	4.0
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Primary diagnosis—surgical indicator	3,946	44.3	1,471	47.3	1,255	46.6	847	46.3	373	29.4
Intensive care unit stay >7 days before admission										
No	8,621	96.9	3,091	99.5	2,658	98.7	1,742	95.1	1,130	89.1
Yes	279	3.1	16	0.5	36	1.3	89	4.9	138	10.9
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Comorbid condition categories										
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	5,700	64.0	1,924	61.9	1,685	62.6	1,065	58.2	1,026	80.9
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34,35)	3,582	40.2	1,105	35.6	1,103	40.9	750	41.0	624	49.2
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43,44,45,189)	4,772	53.6	1,892	60.9	1,698	63.0	879	48.0	303	23.9
Psych/depression (HCC54,57,58,59,60,55,56)	1,055	11.9	392	12.6	294	10.9	185	10.1	184	14.5
Head and spine injury (HCC166,167,70,71,72)	454	5.1	289	9.3	62	2.3	31	1.7	72	5.7
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	1,175	13.2	584	18.8	260	9.7	184	10.1	147	11.6
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	2,815	31.6	812	26.1	581	21.6	485	26.5	937	73.9
Stroke (HCC99,100,101,102,103,104)	1,708	12.1	1,058	34.1	287	10.7	167	9.2	196	15.5
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111,112)	3,393	38.1	957	30.8	845	31.4	659	36.0	932	73.5
Acute and chronic renal (HCC135,136,137,138)	1,934	21.7	533	17.2	514	19.1	314	17.2	573	45.2
Cellulitis (HCC120,164)	506	5.7	133	4.2	141	5.2	86	4.7	146	11.5
Urinary tract infection (HCC141,144)	2,192	24.6	974	31.4	594	22.1	228	12.5	396	31.2
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

(continued)

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Major treatment: hemodialysis										
No	8,522	97.4	2,998	97.9	2,607	98.6	1,779	98.7	1,138	91.3
Yes	231	2.6	63	2.1	36	1.4	24	1.3	108	8.7
Total	8,753	100.0	3,061	100.0	2,643	100.0	1,803	100.0	1,246	100.0
Major treatment: total parenteral nutrition										
No	8,622	98.5	3,046	99.5	2,637	99.8	1,800	99.8	1,139	91.4
Yes	131	1.5	15	0.5	6	0.2	3	0.2	107	8.6
Total	8,753	100.0	3,061	100.0	2,643	100.0	1,803	100.0	1,246	100.0
Major treatment: central line management										
No	7,802	89.1	2,890	94.4	2,588	97.9	1,778	98.6	546	43.8
Yes	951	10.9	171	5.6	55	2.1	25	1.4	700	56.2
Total	8,753	100.0	3,061	100.0	2,643	100.0	1,803	100.0	1,246	100.0
Severe pressure ulcer present (stage 3, 4, unstageable, or stage 2 > 1 month)										
No	8,591	96.5	3,064	98.6	2,628	97.6	1,812	99.0	1,087	85.7
Yes	309	3.5	43	1.4	66	2.5	19	1.0	181	14.3
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Turning surfaces—at least one not intact										
No	6,953	78.2	2,230	72.0	2,182	81.1	1,694	92.5	847	66.8
Yes	1,935	21.8	869	28.0	508	18.9	137	7.5	421	33.2
Total	8,888	100.0	3,099	100.0	2,690	100.0	1,831	100.0	1,268	100.0
Major wounds present										
No	8,131	91.4	2,961	95.3	2,543	94.4	1,656	90.4	971	76.6
Yes	769	8.6	146	4.7	151	5.6	175	9.6	297	23.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

(continued)

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Cognitive status (Brief Interview for Mental Status [BIMS])										
Intact	5,551	62.4	1,879	60.5	1,714	63.6	1,392	76.0	566	44.6
Moderately impaired	1,554	17.5	656	21.1	459	17.0	260	14.2	179	14.1
Severely impaired	1,682	19.0	552	17.8	504	18.7	155	8.5	471	37.2
Missing	113	1.3	20	0.6	17	0.6	24	1.3	52	4.1
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Expression										
Without difficulty	6,318	71.0	2,084	67.1	2,090	77.6	1,510	82.5	634	50.0
Some difficulty	1,437	16.1	632	20.3	362	13.4	244	13.3	199	15.9
Frequent difficulty	566	6.4	241	7.8	173	6.4	50	2.7	102	8.0
Rarely expresses self or is very difficult to understand	313	3.5	118	3.8	46	1.7	21	1.2	128	10.1
Missing	266	3.0	32	1.0	23	0.9	6	0.3	205	16.2
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Prior functioning—self-care function: dependent										
No	8,551	96.1	3,074	98.9	2,568	95.3	1,729	94.4	1,180	93.1
Yes	349	3.9	33	1.1	126	4.7	102	5.6	88	6.9
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Prior functioning—mobility: (ambulation/wheelchair): dependent										
No	8,030	90.2	2,953	95.0	2,333	86.6	1,654	90.3	1,090	86.0
Yes	870	9.8	154	5.0	361	13.4	177	9.7	178	14.0
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
History of falls										
No	5,791	65.1	1,925	62.0	1,510	56.1	1,365	74.6	991	78.2
Yes	3,109	34.9	1,182	38.0	1,184	44.0	466	25.5	277	21.9
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

(continued)

Table 2-13. Independent CARE Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Bowel: indwelling or external device used										
No	8,528	95.8	3,007	96.8	2,632	97.7	1,809	98.8	1,080	85.2
Yes	372	4.2	100	3.2	62	2.3	22	1.2	188	14.8
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Bladder incontinence										
No	5,462	61.4	1,803	58.0	1,824	67.7	1,400	76.5	435	34.3
Yes	3,438	38.6	1,304	42.0	870	32.3	431	23.5	833	65.7
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Swallowing: symptoms of a disorder present										
No	8,298	93.2	2,764	89.0	2,564	95.2	1,771	96.7	1,199	94.6
Yes	602	6.8	343	11.0	130	4.8	60	3.3	69	5.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Swallowing: nothing by mouth (NPO)										
No	8,195	92.2	3,002	96.9	2,655	98.7	1,818	99.3	720	56.8
Yes	692	7.8	97	3.1	35	1.3	12	0.7	548	43.2
Total	8,887	100.0	3,099	100.0	2,690	100.0	1,830	100.0	1,268	100.0
Respiratory status—Impaired										
No	6,970	78.3	2,521	81.1	2,205	81.9	1,388	75.8	856	67.5
Yes	1,930	21.7	586	18.9	489	18.2	443	24.2	412	32.5
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Ventilator (weaning or nonweaning)										
No	8,549	96.1	3,106	100.0	2,691	99.9	1,831	100.0	921	72.6
Yes	351	3.9	1	0.0	3	0.1	0	0.0	347	27.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Sitting endurance: no, could not do										
No	8,243	92.6	2,967	95.5	2,563	95.1	1,772	96.8	941	74.2
Yes	657	7.4	140	4.5	131	4.9	59	3.2	327	25.8
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

(continued)

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall N	Overall Percent	IRF N	IRF Percent	SNF N	SNF Percent	HHA N	HHA Percent	LTCH N	LTCH Percent
Sitting endurance: yes, can do with support										
No	5,272	59.2	1,638	52.7	1,599	59.4	1,207	65.9	828	65.3
Yes	3,628	40.8	1,469	47.3	1,095	40.7	624	34.1	440	34.7
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Sitting endurance: not assessed due to medical restriction										
No	8,457	95.0	3,025	97.4	2,617	97.1	1,800	98.3	1,015	80.1
Yes	443	5.0	82	2.6	77	2.9	31	1.7	253	20.0
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Possible depression present										
No	8,310	93.4	2,865	92.2	2,530	93.9	1,746	95.4	1,169	92.2
Yes	590	6.6	242	7.8	164	6.1	85	4.6	99	7.8
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Possible depression present: no interview, comatose, or missing										
No	6,058	68.1	2,151	69.2	2,060	76.5	1,216	66.4	631	49.8
Yes	2,842	31.9	956	30.8	634	23.5	615	33.6	637	50.2
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
High LTCH or IRF market										
Yes	6,242	70.1	2,471	79.5	1,964	72.9	759	41.5	1,048	82.7
No	2,658	29.9	636	20.5	730	27.1	1,072	58.6	220	17.4
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0
Prior acute hospitalization in the last 12 months: one										
No	6,862	77.1	2,427	78.1	2,047	76.0	1,395	76.2	993	78.3
Yes	2,038	22.9	680	21.9	647	24.0	436	23.8	275	21.7
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

(continued)

Table 2-13. Independent Variable Descriptive Statistics for CARE and Claims Variables, Overall and by First PAC Setting (continued)

Variable Name	Overall <i>N</i>	Overall Percent	IRF <i>N</i>	IRF Percent	SNF <i>N</i>	SNF Percent	HHA <i>N</i>	HHA Percent	LTCH <i>N</i>	LTCH Percent
Prior acute hospitalization in the last 12 months: two or more										
No	7,695	86.5	2,738	88.1	2,335	86.7	1,567	85.6	1,055	83.2
Yes	1,205	13.5	369	11.9	359	13.3	264	14.4	213	16.8
Total	8,900	100.0	3,107	100.0	2,694	100.0	1,831	100.0	1,268	100.0

NOTE: CARE, Continuity Assessment and Record Evaluation; HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; PAC, post-acute care; SNF, skilled nursing facility.

SOURCE: MMOR063, ASPERISK2_097.

- Cognitive status
 - Cognitive status (Brief Interview for Mental Status [BIMS] with observational assessment): Indicates whether patients' cognitive abilities are intact, borderline, moderately impaired, or severely impaired on the basis of the BIMS or an observational assessment of cognitive status for patients for whom interviews were not feasible. Thresholds for combined BIMS score are based on standards used for the MDS: cognitive status intact or borderline (13–15), moderately impaired (8–12), or severely impaired (≤ 7). Models used a four-level cognition variable with indicators for severe, moderate, intact or borderline, and missing. Patients assessed using the observational assessment were classified as cognitively intact or borderline if they could recall all four observational items, or three items including whether they were in a hospital, nursing home, or home; patients were classified as having moderate impairment if two items were recalled or three were recalled but not whether the patient was in a hospital, nursing home, or home; patients were classified as severely impaired if none or only one of the four items was recalled, or two were recalled but not whether the patient was in hospital, nursing home, or home.
- Possible depression: Patients who indicated that they were feeling sad often or always during the past 2 weeks were considered depressed (yes, no, or no interview/comatose/missing).
- Expression
 - Indicates a patient who (1) rarely or never expresses self or speech is very difficult to understand, (2) frequently exhibits difficulty with expressing needs and ideas, (3) exhibits some difficulty with expressing needs and ideas or speech is not clear, or (4) expresses complex messages without difficulty and with speech that is clear and easy to understand.
- Prior functioning
 - Self-care function: Indicates whether, before the current illness, exacerbation, or injury, the patient was dependent in bathing, dressing, using the toilet, or eating. Patients were classified as "independent," "needed partial assistance," or "dependent" in these items. Patients were considered independent if they completed the activities by themselves, with or without an assistive device, with no assistance from a helper. Patients were considered dependent if a helper completed the activity for them.
 - Mobility (ambulation): Indicates whether, before the current illness, exacerbation, or injury, the patient was dependent in walking from room to room (with or without devices such as cane, crutch, or walker). Patients were considered independent if they completed the activities by themselves, with or without an assistive device, with no assistance from a helper. Patients were considered dependent if a helper completed the activity for them.
 - Mobility (wheelchair): Indicates whether, before the current illness, exacerbation, or injury, the patient was dependent moving from room to room using a wheelchair, scooter, or other wheeled mobility device. Patients were considered independent if they completed the activities by themselves, with or without an assistive device, with no assistance from a helper. Patients were considered dependent if a helper completed the activity for them.

- Impairment—This set of covariates includes impairment status for the following:
 - Bladder incontinence: Based on frequency of incontinence variable. Patients are incontinent if response is incontinent less than daily, incontinent daily, always incontinent, no urine/bowel output, or not applicable (e.g., indwelling catheter) (yes/no).
 - Bowel function: Indwelling or external device used (yes/no).
 - Swallowing symptoms: (1) Symptoms of disorder present: Any signs of coughing or choking during meals or when swallowing medications, holding food in mouth or cheeks or residual food in mouth after meals, or loss of liquids or solids from mouth when eating or drinking. (2) NPO—intake not by mouth: Not taking food by mouth, which may be either a response to a swallowing impairment or a nutritional deficiency. (3) No signs and symptoms or NPO.
 - Respiratory Status—Impaired: Patients were considered impaired if they were using supplemental oxygen; patients with no oxygen use reported were considered impaired if they were short of breath or dyspneic with minimal or less exertion (yes/no). Patients on ventilators are included in a separate category.
 - Sitting endurance: Patients were scored on whether they could safely sit for 15 minutes with support, without support, or not at all (yes/no).
- Motor function: This additive measure combines a patient’s ratings on 22 self-care and mobility items into a single scale with a range of 22 to 132, with 132 being completely independent and 22 being completely dependent in mobility function.
- History of falls: Has the patient had two or more falls in the past year or any fall with injury in the past year (yes/no)?
- High LTCH or IRF market: Indicator for whether there is an LTCH provider, IRF provider, or both in the market area of the episode initiating acute hospitalization.
- Wage index: The hospital wage index for the Core-Based Statistical Area of the index acute hospital provider was included in models predicting PAC episode costs to parallel the payment models that used standardized payments to account for geographic differences in payment.

2.5 Item Crosswalk Approach

For every CARE-based variable in the risk adjustment model, RTI identified analogous items in the MDS 2.0 for SNF, the IRF-PAI for IRF, and the OASIS-B for HHA. These were the assessment instruments collected at the time of the PAC PRD data collection in 2008–2009. This crosswalk exercise built on work with CMS during the CARE Item Set development effort to identify related items on the current assessment instruments that map to the standardized measure in the CARE Item Set.

In June 2012, a series of in-person workgroups comprising staff from ASPE and CMS was convened at CMS to review the proposed crosswalk. One of the main goals of the workgroups was to solicit feedback on the following questions:

- Are the proposed analogous items from MDS 2.0, IRF-PAI, and OASIS-B the right substitutes for the CARE items to use in the PAC episode risk adjustment models?

- Are the proposed approaches to operationalizing the items and to creating analogous variables appropriate?
- Are there additional items from the MDS 2.0, IRF-PAI, or OASIS-B that can be included in PAC episode risk adjustment models?

RTI received valuable comments and recommendations during the workgroups. After these meetings, RTI refined the definitions of some analogous variables and updated the crosswalk.

RTI created three data files to implement the item crosswalk analysis: (1) CARE + MDS 2.0 for beneficiaries in the PAC PRD sample with a SNF as their first PAC setting, (2) CARE + OASIS-B for beneficiaries in the PAC PRD sample with an HHA as their first PAC setting, and (3) CARE + IRF-PAI for beneficiaries in the PAC PRD sample with an IRF as their first PAC setting. Assessment data were merged using the process described below.

- For beneficiaries with a SNF as their first PAC setting, we attempted to match each SNF claim to an MDS 2.0 assessment (either a 14-day admission assessment or a 5-day prospective payment system assessment) with an Assessment Reference Date within 7 days of the patient's admission date (claim admission date). Beneficiary identification number (HICN), gender, and birthdate were the primary matching variables. When these matching criteria were not successful, a secondary match was performed by comparing a CARE proxy Social Security Number (SSN) (the first 9 digits of the CARE HICNs), gender, and birthdate to the MDS 2.0 SSN, gender, and birthdate. Overall we were able to find an MDS assessment for 2,565 out of 2,694 patients (95.2%) in the PAC PRD sample of beneficiaries with a SNF as their first PAC setting.
- For beneficiaries with an HHA as their first PAC setting, we attempted to match each HHA claim to an OASIS-B assessment (either a Start of Care or a Resumption of Care assessment) with a Start (Resumption) of Care Date within 4 days of the patient's claim start date. HICN, gender, and birthdate were the primary matching variables. When these matching criteria were not successful, two additional steps were performed. First, we generated a CARE proxy SSN using the first 9 digits of the HICNs on CARE and looked for a match using this variable and the OASIS-B SSN, gender, and birthdate variables. Second, following the advice of HHA researchers who had observed agencies erroneously recording HICN in the OASIS Medicaid ID field, we performed another match between the CARE HICN and OASIS-B Medicaid ID number, in addition to gender and birthdate. In the end we found matched OASIS assessments for 1,740 out of 1,831 patients (95.0%) in the PAC PRD sample of beneficiaries with an HHA as their first PAC setting.
- For beneficiaries with an IRF as their first PAC setting, the merge was based on beneficiary identification number, gender, birthdate, and a match on admission date between the IRF claim and an IRF-PAI assessment. We identified IRF-PAI assessments for 2,566 out of 3,107 patients (82.6%) in the PAC PRD sample of beneficiaries with an IRF as their first PAC setting.

The item crosswalk and RTI's analyses of the crosswalked items are discussed in **Section 3**.

2.6 Analytic Approach—Models

Four main research questions guided this work:

1. How well do CARE variables predict PAC episode costs compared with PAC episode payments?
2. Can assessment items from federally mandated assessment instruments collected in PAC settings be crosswalked to CARE items and substituted into models predicting PAC episode costs?
3. Can other items from federally mandated assessment instruments be included in episode risk adjustment models to improve prediction of PAC episode costs?
4. How do the results of models predicting PAC episode costs differ when the models are applied to a national sample rather than to the sample of beneficiaries from the PAC PRD?

Table 2-14 summarizes the analyses conducted to answer these questions by indicating the sample on which analyses were run and the independent variables that were used in the analyses. The first research question was addressed by running the same model on two different dependent variables, PAC episode payments and PAC episode costs. The second research question was addressed by comparing the results of crosswalked models using PAC episode costs as the dependent variable to a model using the same dependent variable but with CARE items as the independent variables. The third research question was addressed by comparing the results of a model with crosswalked items plus additional items for the current assessment instruments to the results of the strict crosswalk models to see if any additional items improved the ability to predict PAC episode costs. The fourth research question was addressed by running the model on the 2008 national sample to see whether the results of models predicting episode costs using MDS 2.0, IRF-PAI, and OASIS-B assessment instruments yielded similar results when performed on national data compared with the PAC PRD data sample. Each model was run for all three episode definitions and by first PAC setting in the episode.

Table 2-14. Analysis Summary

Sample	Independent Variables: CARE Variables	Independent Variables: Item Crosswalk (MDS 2.0, IRF-PAI, or OASIS-B)	Independent Variables: Item Crosswalk (MDS 2.0, IRF-PAI, or OASIS-B) + Additional Items
PAC PRD sample	Research Question 1: Dependent variable = payment/episode Dependent variable = cost/ episode	Research Question 2: Dependent variable = costs/episode	Research Question 3: Dependent variable = costs/episode
2008 national sample	—	—	Research Question 4: Dependent variable = costs/episode

NOTE: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; PAC PRD, Post-Acute Care Payment Reform Demonstration.

3. ITEM CROSSWALK

In this section, we present the crosswalk for CARE items used in the risk adjustment models to analogous items in MDS 2.0, OASIS-B, and IRF-PAI, the assessment instruments in use at the time during our study period (2008–2009). We also present the cross-tabulation analyses between the variables as defined on CARE compared with how they are defined in MDS 2.0, OASIS-B, and IRF-PAI. We outline limitations of the crosswalk and discuss other variables from the assessment instruments that could potentially be included in the PAC episode risk adjustment models.

3.1 Crosswalk for CARE Items to MDS 2.0, OASIS-B, and IRF-PAI

In this section we present the crosswalk for CARE items used in the PAC episode risk adjustment analyses to analogous items in the MDS 2.0, OASIS-B, and IRF-PAI items. The discussion is organized by the category of variables: function, cognitive, and medical status.

3.1.1 Function

Motor Function Score

Table 3-1 presents the crosswalk for the CARE motor function score to MDS 2.0, OASIS-B, and IRF-PAI. We present the CARE items used in the CARE Motor score in the leftmost column of Table 3-1. For each CARE item, the analogous items on the MDS 2.0, OASIS-B, and IRF-PAI are presented. Some tasks on the MDS 2.0, OASIS-B, and IRF-PAI are similar to or overlap with tasks in multiple CARE function items and thus appear in more than one row. For example, the MDS 2.0 Dressing item was identified as analogous to three CARE items—Upper body dressing, Lower body dressing and Putting on/taking off footwear.

Table 3-1. Crosswalk: CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. A1. Eating: The ability to use suitable utensils to bring food to the mouth and swallow food once the meal is presented on a table/tray. Includes modified food consistency.	(G1h A & B) Eating: How resident eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g., tube feeding, total parenteral nutrition) SNF PPS Item	(M0710) Feeding or Eating: Ability to feed self meals and snacks. Note: This refers only to the process of eating, chewing, and swallowing, not preparing the food to be eaten.	39A. Eating includes the ability to use suitable utensils to bring food to the mouth, as well as the ability to chew and swallow the food once the meal is presented in the customary manner on a table or tray. The patient performs this activity safely. IRF PPS Item
VI. A3. Oral Hygiene: The ability to use suitable items to clean teeth. Dentures: The ability to remove and replace dentures from and to mouth, and manage equipment for soaking and rinsing.	(G1j A & B) Personal Hygiene: How resident maintains personal hygiene, including combing hair, brushing teeth, shaving, applying makeup, washing/drying face, hands, and perineum (EXCLUDE baths and showers)	(M0640) Grooming: Ability to tend to personal hygiene needs (i.e., washing face and hands, hair care, shaving or make up, teeth or denture care, fingernail care).	39B. Grooming includes oral care, hair grooming (combing or brushing hair), washing the hands, washing the face, and either shaving the face or applying make-up. If the subject neither shaves nor applies make-up, Grooming includes only the first four tasks. The patient performs this activity safely. This item includes obtaining articles necessary for grooming. IRF PPS Item
VI. A4. Toilet Hygiene: The ability to maintain perineal hygiene, adjust clothes before and after using toilet, commode, bedpan, urinal. If managing ostomy, include wiping opening but not managing equipment.	(G1i A & B) Toilet Use: How resident uses the toilet room (or commode, bedpan, urinal); transfers on/off toilet, cleanses, changes pad, manages ostomy or catheter, adjusts clothes SNF PPS Item	NA	39F. Toileting includes maintaining perineal hygiene and adjusting clothing before and after using a toilet, commode, bedpan, or urinal. The patient performs this activity safely. IRF PPS Item

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. C1. Wash Upper Body: The ability to wash, rinse, and dry the face, hands, chest, and arms while sitting in a chair or bed.	NA	NA	NA
VI. C2. Shower/Bathe Self: The ability to bathe self in shower or tub, including washing, rinsing, and drying, self. Does not include transferring in/out of tub/shower.	(G2A & G2B) Bathing: How resident takes full-body bath/shower, sponge bath, and transfers in/out of tub/shower (EXCLUDE washing of back and hair.)	(M0670) Bathing: Ability to wash entire body. Excludes grooming (washing face and hands only). HHA PPS Item	39C. Bathing includes washing, rinsing, and drying the body from the neck down (excluding the neck and back) in either a tub, shower or sponge/bed bath. The patient performs the activity safely. IRF PPS Item
VI. A5. Upper Body Dressing: The ability to put on and remove shirt or pajama top. Includes buttoning if applicable.	(G1g A & B) Dressing: How resident puts on, fastens, and takes off all items of street clothing, including donning/removing prosthesis	(M0650) Ability to Dress Upper Body (with or without dressing aids) including undergarments, pullovers, front-opening shirts and blouses, managing zippers, buttons, and snaps. HHA PPS Item	39D. Dressing—Upper Body includes dressing and undressing above the waist, as well as applying and removing a prosthesis or orthosis when applicable. The patient performs this activity safely. IRF PPS Item
VI. A6. Lower Body Dressing: The ability to dress and undress below the waist, including fasteners. Does not include footwear.	(G1g A & B) Dressing: How resident puts on, fastens, and takes off all items of street clothing, including donning/removing prosthesis	(M0660) Ability to Dress Lower Body (with or without dressing aids) including undergarments, slacks, socks or nylons, shoes. HHA PPS Item	39E. Dressing—Lower Body includes dressing and undressing from the waist down, as well as applying and removing a prosthesis or orthosis when applicable. The patient performs this activity safely. IRF PPS Item

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. C6. Putting on/Taking off Footwear: The ability to put on and take off socks and shoes or other footwear that are appropriate for safe mobility.	(G1g A & B) Dressing: How resident puts on, fastens, and takes off all items of street clothing, including donning/removing prosthesis	(M0660) Ability to Dress Lower Body (with or without dressing aids) including undergarments, slacks, socks or nylons, shoes. HHA PPS Item	39E. Dressing—Lower Body includes dressing and undressing from the waist down, as well as applying and removing a prosthesis or orthosis when applicable. The patient performs this activity safely. IRF PPS Item
VI. B1. Lying to Sitting on Side of Bed: The ability to safely move from lying on the back to sitting on the side of the bed with feet flat on the floor, no back support.	(G1a A & B) Bed Mobility: How resident moves to and from lying position, turns side to side, and positions body while in bed SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39I. Transfers: Bed, Chair, Wheelchair includes all aspects of transferring from a bed to a chair and back, or from a bed to a wheelchair and back, or coming to a standing position if walking is the typical mode of locomotion. The patient performs the activity safely. IRF PPS Item
VI. C3. Roll Left and Right: The ability to roll from lying on back to left and right side, and roll back to back.	(G1a A & B) Bed Mobility: How resident moves to and from lying position, turns side to side, and positions body while in bed SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39I. Transfers: Bed, Chair, Wheelchair includes all aspects of transferring from a bed to a chair and back, or from a bed to a wheelchair and back, or coming to a standing position if walking is the typical mode of locomotion. The patient performs the activity safely. IRF PPS Item

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. C4. Sit to Lying: The ability to move from sitting on side of bed to lying flat on the bed.	(G1a A & B) Bed Mobility: How resident moves to and from lying position, turns side to side, and positions body while in bed SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39I. Transfers: Bed, Chair, Wheelchair includes all aspects of transferring from a bed to a chair and back, or from a bed to a wheelchair and back, or coming to a standing position if walking is the typical mode of locomotion. The patient performs the activity safely. IRF PPS Item
VI. B2. Sit to Stand: The ability to safely come to a standing position from sitting in a chair or on the side of the bed.	(G1b A & B) Transfer: How resident moves between surfaces—to/from: bed, chair, wheelchair, standing position (EXCLUDE to/from bath/toilet) SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39I. Transfers: Bed, Chair, Wheelchair includes all aspects of transferring from a bed to a chair and back, or from a bed to a wheelchair and back, or coming to a standing position if walking is the typical mode of locomotion. The patient performs the activity safely. IRF PPS Item
VI. B3. Chair/Bed-to-Chair Transfer: The ability to safely transfer to and from a chair (or wheelchair). The chairs are placed at right angles to each other.	(G1b A & B) Transfer: How resident moves between surfaces—to/from: bed, chair, wheelchair, standing position (EXCLUDE to/from bath/toilet) SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39I. Transfers: Bed, Chair, Wheelchair includes all aspects of transferring from a bed to a chair and back, or from a bed to a wheelchair and back, or coming to a standing position if walking is the typical mode of locomotion. The patient performs the activity safely. IRF PPS Item

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. B4. Toilet Transfer: The ability to safely get on and off a toilet or commode.	(G1i A & B) Toilet Use: How resident uses the toilet room (or commode, bedpan, urinal); transfer on/off toilet, cleanses, changes pad, manages ostomy or catheter, adjusts clothes SNF PPS Item	(M0690) Transferring: Ability to move from bed to chair, on and off toilet or commode, into and out of tub or shower, and ability to turn and position self in bed if patient is bedfast. HHA PPS Item	39J. Transfers: Toilet: Toilet includes safely getting on and off a standard toilet IRF PPS Item
VI. B5a. Select the longest distance the patient walks and code his/her level of independence (Level 1–6) on that distance. Observe performance. (Select only one.) 1. Walk 150 ft (45 m): Once standing, can walk at least 150 feet (45 meters) in corridor or similar space. 2. Walk 100 ft (30 m): Once standing, can walk at least 100 feet (30 meters) in corridor or similar space 3. Walk 50 ft (15 m): Once standing, can walk at least 50 feet (15 meters) in corridor or similar space 4. Walk in Room Once Standing: Once standing, can walk at least 10 feet (3 meters) in room, corridor, or similar space.	(G1c A & B) Walk in Room: How resident walks between locations in his/her room (G1d A & B) Walk in Corridor: How resident walks in corridor on unit	(M0700) Ambulation/Locomotion: Ability to SAFELY walk, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces. HHA PPS Item	39L. Locomotion: Walk/Wheelchair: Walk includes walking on a level surface once in a standing position. The patient performs the activity safely. Wheelchair includes using a wheelchair on a level surface once in a seated position. The patient performs the activity safely. IRF PPS Item

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. C7b. Walk 50 Feet With Two Turns: The ability to walk 50 feet and make two turns.	(G1c A & B) Walk in Room: How resident walks between locations in his/her room	(M0700) Ambulation/Locomotion: Ability to SAFELY walk, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces. HHA PPS Item	39L. Locomotion: Walk/Wheelchair: Walk includes walking on a level surface once in a standing position. The patient performs the activity safely. Wheelchair includes using a wheelchair on a level surface once in a seated position. The patient performs the activity safely. IRF PPS Item
VI. C7e. Walking 10 Feet on Uneven Surfaces: The ability to walk 10 feet on uneven or sloping surfaces, such as grass or gravel.	NA	(M0700) Ambulation/Locomotion: Ability to SAFELY walk, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces. HHA PPS Item	NA
VI. C5. Picking up Object: The ability to bend/stoop from a standing position to pick up small object such as a spoon from the floor.	NA	NA	NA

(continued)

Table 3-1. Crosswalk for CARE Motor Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
VI. C7a. 1 Step (curb): The ability to step over a curb or up and down one step.	NA	NA	NA
VI. C7d. 4 Steps: The ability to go up and down 4 steps with or without a rail.	NA	NA	39M. Stairs includes going up and down 12 to 14 stairs (one flight) indoors in a safe manner. IRF PPS Item
VI. C7c. 12 Steps: The ability to go up and down 12 steps with or without a rail.	NA	NA	39M. Stairs includes going up and down 12 to 14 stairs (one flight) indoors in a safe manner. IRF PPS Item
VI. C7f. Car Transfer: The ability to transfer in and out of a car or van on the passenger side. Does not include the ability to open/close door or fasten seat belt.	NA	NA	NA

NOTE: Each individual item on the MDS 2.0, OASIS-B, and IRF-PAI assessment instruments was used only once in analogous motor score calculation, even if that item was crosswalked to multiple CARE function items. CARE, Continuity Assessment Record and Evaluation; HHA, home health agency; IRF, inpatient rehabilitation facility; IRF-PAI, IRF-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; PPS, prospective payment system; SNF, skilled nursing facility.

Paralleling the algorithm used to create the CARE additive motor function score, we summed the scores for the analogous function items on each assessment instrument. If an item response indicated “Activity did not occur” or “Unknown,” we recoded the response to the most dependent level. Unlike the other three assessment instruments, MDS 2.0 has two scores for each function item. One score is for self-performance of activities of daily living (ADLs; ranging from 0. INDEPENDENT to 4. TOTAL DEPENDENCE) and one is for ADL support provided (ranging from 0. No setup or physical help from staff to 3. Two+ persons physical assist). First, we applied the aforementioned recoding scheme for MDS 2.0 self-performance scores. However, for each of the MDS 2.0 support scores, we recoded “ADL activity itself did not occur during entire 7 days” to the mode of the item score. For most support scores the mode was level 2, “One person physical assist.” Second, we created two variants of the MDS 2.0 motor score. The first one was the sum of self-performance scores and the second was the sum of self-performance and support scores. The two scores were very highly correlated (Pearson correlation coefficient = 0.98).⁵ We thus chose to use the sum of self-performance and support scores, given that each function item was scored on the basis of both self-performance and support provided.

To examine the performance of the crosswalk for the function variable, we created scatter plots and examined the correlations between the CARE motor function score and each of the analogous motor function scores. **Figure 3-1** shows the scatter plot between the CARE motor function score and the MDS 2.0 motor function score. The range of MDS 2.0 motor function score was 0–63. As expected, the two scores were negatively correlated, because a higher CARE motor function score indicated a higher level of independence, whereas a higher MDS 2.0 function score indicated a lower level of independence. The magnitude of the correlation was moderate (correlation coefficient = -0.63).

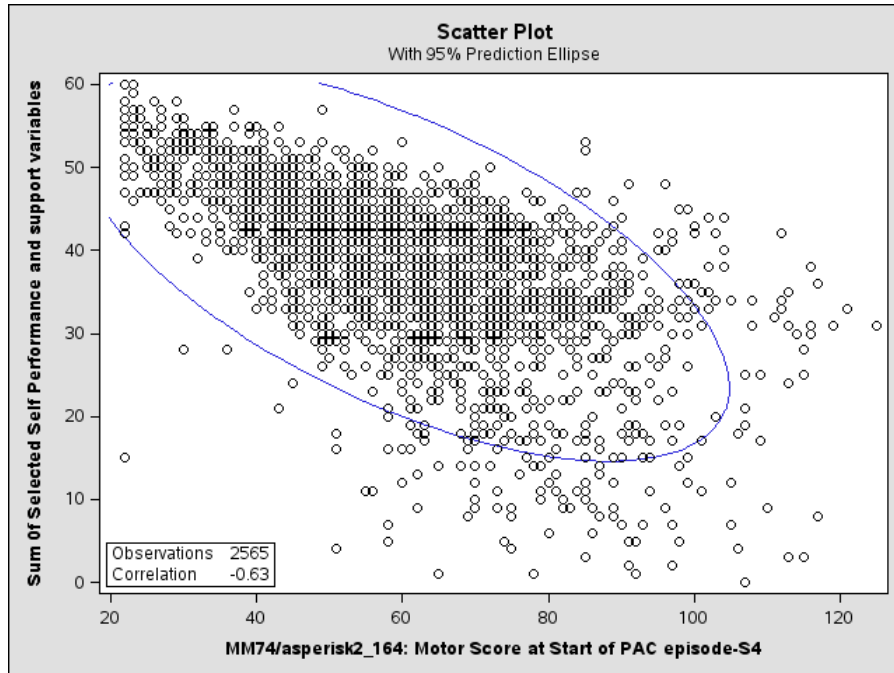
Figure 3-2 shows the scatter plot between the CARE motor function score and the OASIS-B motor function score. The range of OASIS-B motor function was 0–29. The two scores were also moderately negatively correlated (correlation coefficient = -0.653), as a higher OASIS-B motor function score indicated a lower level of independence whereas higher motor function on CARE indicated a higher level of independence.

Figure 3-3 shows the scatter plot between the CARE motor function score and IRF-PAI/FIM® motor function score.⁶ Among the three assessment instruments, the IRF-PAI/FIM® motor function score was the closest match to the CARE motor function score. As with the CARE motor function score, a higher IRF-PAI/FIM® motor function score indicated a higher level of independence. The range of IRF-PAI/FIM® motor (10–70) was more comparable to the range of CARE motor function score (22–132). The correlation coefficient between the CARE motor function score and IRF-PAI/FIM® motor function score was about 0.8.

⁵ SOURCE: chart_mds023.xls

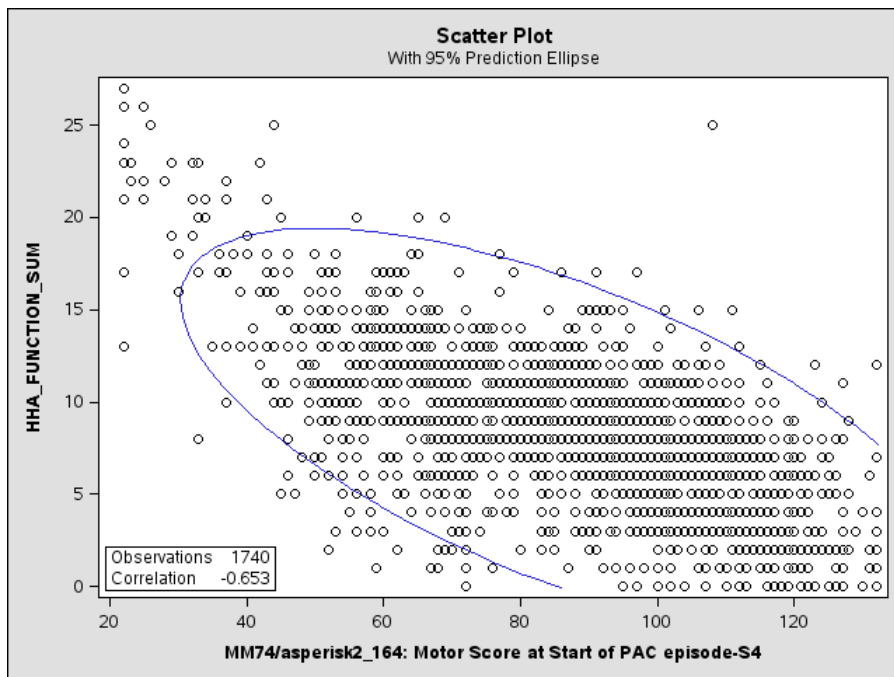
⁶ FIM® is a trademark of the Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc.

Figure 3-1. Scatter Plot Between CARE Motor Function Score and MDS 2.0 Motor Function Score



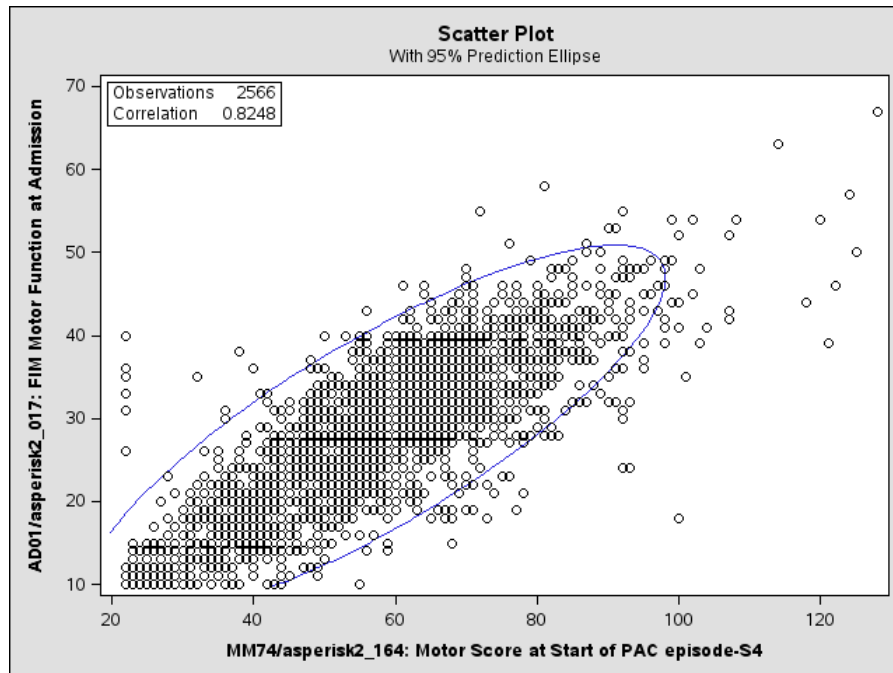
SOURCE: \csaur\output\asperisk2_176.

Figure 3-2. Scatter Plot Between CARE Motor Function Score and OASIS-B Motor Function Score



SOURCE: \csaur\output\asperisk2_177.

Figure 3-3. Scatter Plot Between CARE Motor Function Score and IRF-PAI/FIM® Motor Function Score



SOURCE: \csaur\output\asperisk2_175.

Prior Function

Two CARE variables measuring prior function, one for self-care and one for mobility, were included in the risk adjustment models. Of the three assessment instruments, only OASIS-B has items to measure patients' prior functional status. The analogous items and the definitions to create the OASIS-B prior function variables are presented in **Table 3-2**. Five OASIS-B prior function items (Prior Ability to Dress Upper Body, Prior Ability to Dress Lower Body, Prior Bathing, Prior Toileting, and Prior Feeding or Eating) were identified as analogous to the CARE prior self-care function variable. If any of the OASIS-B prior function items indicated the highest level of dependency (the value depending on the specific item), we defined prior self-care function as "dependent." The OASIS-B item Prior Ambulation/ Locomotion was identified as analogous to the CARE prior mobility function variable. We used three response levels of this variable (Able to walk only with the supervision or assistance of another person at all times, Chairfast, and Bedfast) to identify beneficiaries as dependent in prior mobility function.

We ran cross-tabulations between prior function defined using CARE compared with using OASIS-B. Sensitivity and specificity, using CARE as the standard, were also calculated to quantify misclassification. The results are presented in **Tables 3-3** and **3-4**. Although prior self-care function defined on OASIS-B seemed to be a close match to the CARE item conceptually, the data did not agree as much as we expected. Prior self-care function based

Table 3-2. Crosswalk for CARE Prior Function Items to MDS 2.0, OASIS-B, and IRF-PAI

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Prior Functioning—Self Care Function II. B5a. Self Care: Did the patient need help bathing, dressing, using the toilet, or eating? 1. Dependent—A helper completed the activity for the patient.</p>	NA	<p>(M0650) Prior Ability to Dress Upper Body (with or without dressing aids) including undergarments, pullovers, front-opening shirts and blouses, managing zippers, buttons, and snaps. 3—Patient depends entirely upon another person to dress the upper body.</p> <p>or</p> <p>(M0660) Prior Ability to Dress Lower Body (with or without dressing aids) including undergarments, slacks, socks or nylons, shoes. 3—Patient depends entirely upon another person to dress lower body.</p> <p>or</p> <p>(M0670) Prior Bathing: Ability to wash entire body. Excludes grooming (washing face and hands only). 5—Unable to effectively participate in bathing and is totally bathed by another person.</p> <p>or</p> <p>(M0680) Prior Toileting: Ability to get to and from the toilet or bedside commode. 4—Is totally dependent in toileting.</p> <p>or</p> <p>(M0710) Prior Feeding or Eating: Ability to feed self meals and snacks. Note: This refers only to the process of eating, chewing, and swallowing, not preparing the food to be eaten. 5—Unable to take in nutrients orally or by tube feeding.</p>	NA

(continued)

Table 3-2. Crosswalk for CARE Prior Function Items to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Prior Functioning—Mobility (Ambulation/Wheelchair)</p> <p>II. B5b. Indoor Mobility (Ambulation): Did the patient need assistance with walking from room to room (with or without devices such as cane, crutch, or walker)? 1. Dependent—A helper completed the activity for the patient. or</p> <p>II. B5d. Indoor Mobility (Wheelchair): Did the patient need assistance with moving from room to room using a wheelchair, scooter, or other wheeled mobility device? 1. Dependent—A helper completed the activity for the patient. 2. Needed Some Help—Patient needed partial assistance from another person to complete activities.</p>	NA	<p>(M0700) Prior Ambulation/Locomotion: Ability to SAFELY walk, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces. 2—Able to walk only with the supervision or assistance of another person at all times. 4—Chairfast, unable to ambulate and is unable to wheel self. 5—Bedfast, unable to ambulate or be up in a chair.</p>	NA

NOTE: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set.

Table 3-3. Cross-Tabulation Between Prior Self-Care Function on CARE and OASIS-B

CARE Item: Prior Functioning Self-Care Function: Dependent	OASIS-B Prior Self- Care Function: No	OASIS-B Prior Self- Care Function: Yes	OASIS-B Prior Self- Care Function: Total	OASIS-B Prior Self- Care Function: Sensitivity ^a	OASIS-B Prior Self- Care Function: Specificity ^a
No	1,587	59	1,646	—	—
Yes	55	39	94	—	—
Total	1,642	98	1,740	—	—
—	—	—	—	0.415	0.964

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^aSensitivity and specificity were calculated using the CARE item as the standard. SOURCE: ASPERISK2_031.

Table 3-4. Cross-Tabulation Between Prior Mobility Function on CARE and OASIS-B

CARE Item: Prior Functioning- Mobility: (Ambulation/ Wheelchair): Dependent	OASIS-B Prior Mobility Function: No	OASIS-B Prior Mobility Function: Yes	OASIS-B Prior Mobility Function: Total	OASIS-B Prior Mobility Function: Sensitivity ^a	OASIS-B Prior Mobility Function: Specificity ^a
No	1,473	101	1,574	—	—
Yes	105	61	166	—	—
Total	1,578	162	1,740	—	—
—	—	—	—	0.367	0.936

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^aSensitivity and specificity were calculated using the CARE item as the standard. SOURCE: ASPERISK2_031.

on OASIS-B identified patients dependent for prior self-care function based on CARE less than half the time (sensitivity = 0.415, Table 3-3). The results were similar for prior mobility function (Table 3-4). Out of 166 patients who were dependent for prior mobility function according to CARE, only 61 were identified as dependent by OASIS-B (sensitivity = 0.367).

Bowel and Bladder

Two CARE items, one for bowel device and one for bladder incontinence, were included in the risk adjustment models. The items measuring bowel and bladder function on MDS 2.0, OASIS-B, and IRF-PAI are very different from the items on CARE. We therefore identified conceptually relevant items in the MDS 2.0, OASIS-B, and IRF-PAI. **Table 3-5** presents the crosswalk for bowel and bladder items.

Table 3-5. Crosswalk for CARE Bowel and Bladder Function to MDS 2.0, OASIS-B, and IRF-PAI

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Bowel Device</p> <p>V. A2b. Bowel: Does this patient use an external or indwelling device or require intermittent catheterization?</p> <p>1. Yes</p>	<p>H3i. Ostomy present</p>	<p>(M0540) Bowel Incontinence Frequency: NA—Patient has ostomy for bowel elimination</p> <p>or</p> <p>(M0550) Ostomy for Bowel Elimination: Does this patient have an ostomy for bowel elimination that (within the last 14 days): a) was related to an inpatient facility stay, or b) necessitated a change in medical or treatment regimen? 1—Patient's ostomy was not related to an inpatient stay and did not necessitate change in medical or treatment regimen. 2—The ostomy was related to an inpatient stay or did necessitate change in medical or treatment regimen.</p> <p>HHA PPS Item</p>	<p>NA</p>

(continued)

Table 3-5. Crosswalk for CARE Bowel and Bladder Function to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Bladder Incontinence</p> <p>V. A3a. Bladder: Indicate the frequency of incontinence</p> <p>2. Incontinent less than daily</p> <p>3. Incontinent daily</p> <p>4. Always incontinent</p> <p>5. No urine/bowel output</p> <p>9. Not applicable (e.g. indwelling catheter)</p>	<p>H1b. Bladder continence</p> <p>2. Occasionally incontinent</p> <p>3. Frequently incontinent</p> <p>4. Incontinent</p> <p>or</p> <p>H3c. External (condom) catheter</p> <p>H3d. Indwelling catheter</p> <p>H3e. Intermittent catheter</p>	<p>(M0520) Urinary Incontinence or Urinary Catheter Presence:</p> <p>2—Patient requires a urinary catheter (i.e., external, indwelling, intermittent, suprapubic)</p> <p>or</p> <p>(M0520) Urinary Incontinence or Urinary Catheter Presence:</p> <p>1—Patient is incontinent and</p> <p>(M0530) When does Urinary Incontinence occur?</p> <p>1—During the night only</p> <p>2—During the day and night</p>	<p>30. Bladder Frequency of Accidents</p> <p>1—Five or more accidents in the past 7 days</p> <p>2—Four accidents in the past 7 days</p> <p>3—Three accidents in the past 7 days</p> <p>4—Two accidents in the past 7 days</p>

NOTE: CARE, Continuity Assessment Record and Evaluation; HHA, home health agency; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; PPS, prospective payment system.

The MDS 2.0 item H3i, Ostomy present, was identified as analogous to the CARE item for bowel device. If the MDS 2.0 ostomy item was checked, we defined bowel device as Yes. The MDS 2.0 items H1b, Bladder continence, and three device items (H3c, External [condom] catheter; H3d, Indwelling catheter; and H3e, Intermittent catheter) were identified as analogous to the CARE item for bladder incontinence. We defined bladder incontinence as Yes if the patient's frequency of incontinence was more than or equal to "occasionally" or if the patient used any of the three types of catheters. We ran a cross-tabulation between bowel and bladder function on CARE compared with MDS 2.0 to analyze the degree to which the item responses on the different assessment instruments overlapped. The results are presented in **Tables 3-6** and **3-7**. Sensitivity and specificity, using CARE as the standard to quantify misclassification, are also presented.

According to Table 3-6, the MDS 2.0 bowel device had moderate sensitivity when tested against the CARE bowel device item. About 57% of those with bowel device based on CARE were also identified as having a device on the MDS 2.0 (sensitivity = 0.569). Note that the CARE bowel device item included the use of bedpan, which may have inflated the prevalence of patients with device based on CARE. The MDS 2.0 bladder incontinence item had high sensitivity (0.850) and specificity (0.726) when tested against the CARE bladder incontinence item (Table 3-7).

OASIS-B had two items relevant to bowel function (M0540, Bowel Incontinence Frequency, and M0550, Ostomy for Bowel Elimination), and we identified these two items to be analogous to the CARE bowel device item. If either item indicated that an ostomy for bowel elimination was present, regardless of whether it was related to an inpatient stay, we identified the use of device as Yes (Table 3-5, third column from left). Two OASIS-B items—M0520, Urinary Incontinence or Urinary Catheter Presence, and M0530, When does Urinary Incontinence occur—were identified as analogous to the CARE bladder incontinence item. If either item indicated that the patient was incontinent or used a catheter, we defined bladder incontinence as Yes.

Tables 3-8 and **3-9** present the cross-tabulation analyses between the CARE and the OASIS-B bowel and bladder function items. The OASIS-B bowel device had moderate sensitivity when tested against CARE (0.667, Table 3-8). Of the 21 patients who used a bowel device based on the CARE assessment, 14 were also identified as using a bowel device on OASIS-B. The bladder incontinence item defined using OASIS-B had high sensitivity (0.780) and specificity (0.884) when tested against CARE (Table 3-9).

No IRF-PAI item was identified as analogous to the CARE bowel device item (Table 3-5, the rightmost column). We compared the CARE bowel device scores with two IRF-PAI items for the same patients and decided not to use either item in the crosswalk due to the difference in scores. The IRF-PAI item 31, Bowel Level of Assistance has a response level indicating "6. Modified Independence (Device)." The frequency of this response level (826 out of

Table 3-6. Cross-Tabulation Between Bowel Function on CARE and MDS 2.0

CARE Item: Bowel Device	MDS 2.0 Bowel Device: No	MDS 2.0 Bowel Device: Yes	MDS 2.0 Bowel Device: Total	MDS 2.0 Bowel Device: Sensitivity^a	MDS 2.0 Bowel Device: Specificity^a
No	2,491	16	2,507	—	—
Yes	25	33	58	—	—
Total	2,516	49	2,565	—	—
—	—	—	—	0.569	0.994

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^aSensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Table 3-7. Cross-Tabulation Between Bladder Incontinence on CARE and MDS 2.0

CARE Item: Bladder Incontinence	MDS 2.0 Bladder Incontinence: No	MDS 2.0 Bladder Incontinence: Yes	MDS 2.0 Bladder Incontinence: Total	MDS 2.0 Bladder Incontinence: Sensitivity^a	MDS 2.0 Bladder Incontinence: Specificity^a
No	1,262	477	1,739	—	—
Yes	124	702	826	—	—
Total	1,386	1,179	2,565	—	—
—	—	—	—	0.850	0.726

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Table 3-8. Cross-Tabulation Between Bowel Function on CARE and OASIS-B

CARE Item: Bowel Device	OASIS-B Bowel Device: No	OASIS-B Bowel Device: Yes	OASIS-B Bowel Device: Total	OASIS-B Bowel Device: Sensitivity^a	OASIS-B Bowel Device: Specificity^a
No	1,706	13	1,719	—	—
Yes	7	14	21	—	—
Total	1,713	27	1,740	—	—
—	—	—	—	0.667	0.992

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^aSensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Table 3-9. Cross-Tabulation Between Bladder Incontinence on CARE and OASIS-B

CARE Item: Bladder Incontinence	OASIS-B Bladder Incontinence: No	OASIS-B Bladder Incontinence: Yes	OASIS-B Bladder Incontinence: Total	OASIS-B Bladder Incontinence: Sensitivity ^a	OASIS-B Bladder Incontinence: Specificity ^a
No	1,173	154	1,327	—	—
Yes	91	322	413	—	—
Total	1,264	476	1,740	—	—
—	—	—	—	0.780	0.884

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^aSensitivity and specificity were calculated using the CARE item as the standard. SOURCE: ASPERISK2_038.

2,566 patients, or 32.2%) was much higher than the frequency of bowel device measured by CARE (81 out of 2,566 patients or 3.2%).⁷ The other IRF-PAI item—32. Bowel Frequency of Accidents—has a response level indicating “6. No accidents; uses device such as an ostomy.” RTI’s analysis revealed that the frequency of this response level was even higher (1,514 out of 2,566 patients, or 59.0%),⁶ potentially because IRFs may check “6. No accidents; uses device such as an ostomy” if a patient was on bowel medications. Given the substantial difference in scores between the IRF-PAI items and the CARE variable, we did not include an IRF-PAI-based bowel device item in the crosswalk. However, we included both IRF-PAI items in the models that used additional assessment items from similar domains (see **Section 3.4** for details).

The IRF-PAI item 30, Bladder Frequency of Accidents, was identified as analogous to the CARE bladder incontinence item. If this IRF-PAI item was scored 1—Five or more accidents in the past 7 days, 2—Four accidents in the past 7 days, 3—Three accidents in the past 7 days, or 4—Two accidents in the past 7 days, we defined bladder incontinence as Yes. For the IRF-PAI, accidents are defined as wetting linen or clothing. IRF-PAI item 30 had a response level indicating “6. No accidents; uses device such as a catheter.” RTI’s analysis revealed that among patients whose score for IRF-PAI item 30 was 6, 57.3% (902) were continent based on CARE. We therefore coded level “6. No accidents; uses device such as a catheter” as 0 (no incontinence) for the bladder incontinent item in our analysis. However, given that a large group of patients whose score for IRF-PAI item 30 was 6 were in fact bladder incontinent based on CARE, we expected low sensitivity for the IRF-PAI bladder incontinence item when tested against CARE.

⁷ SOURCE: ASPERISK2_038.partirfpai.freq.xls.

Table 3-10 presents the cross-tabulation analyses between the bladder incontinence items as defined on CARE compared with IRF-PAI. Bladder incontinence defined using IRF-PAI (bladder accidents) had low sensitivity when tested against CARE (0.233). Of the 1,068 patients who were bladder incontinent based on CARE, only 249 were identified by IRF-PAI as bladder incontinent.

Table 3-10. Cross-Tabulation Between Bladder Incontinence on CARE and IRF-PAI (Bladder Accidents)

CARE Item: Bladder Incontinence	IRF-PAI Bladder Incontinence: No	IRF-PAI Bladder Incontinence: Yes	IRF-PAI Bladder Incontinence: Total	IRF-PAI Bladder Incontinence: Sensitivity ^a	IRF-PAI Bladder Incontinence: Specificity ^a
No	1,383	115	1,498	—	—
Yes	819	249	1,068	—	—
Total	2,202	364	2,566	—	—
—	—	—	—	0.233	0.923

NOTES: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument. ^aSensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

3.1.2 Cognitive Status

Cognitive Status

The risk adjustment models using CARE items included a categorical variable indicating patients' cognitive status according to the BIMS. The BIMS is not on the MDS 2.0, the IRF-PAI, or the OASIS-B. We therefore identified other items on these instruments measuring cognitive status. **Table 3-11** presents the crosswalk between the CARE BIMS items and cognitive impairment as measured on the MDS 2.0, OASIS-B, and IRF-PAI.

RTI used the Cognitive Performance Scale (CPS) in MDS 2.0 as a measure of cognitive impairment. The CPS, which comprises five MDS items, generates a score for each individual ranging from 1 to 7 (with a higher score indicating more severe impairment; Morris et al., 1994). The scale has been validated against the Mini-Mental State Examination and has been used widely in the nursing home literature. The algorithm to calculate the CPS score is presented in **Figure 3-4**. RTI conducted analyses to compare the CPS score with the BIMS score collected on the CARE and empirically selected the cutoffs to match the levels of cognitive status measured by the BIMS items on CARE.

Table 3-12 presents the cross-tabulation analyses between the BIMS items on CARE and MDS 2.0 cognitive status variables. In general, categories of cognitive status defined on the basis of the MDS 2.0 CPS showed a high level of agreement with the BIMS on CARE.

Table 3-11. Crosswalk for CARE Cognitive Status and Mood to MDS 2.0, OASIS-B, and IRF-PAI

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Cognitive Status (BIMS)—Severe Cognitive Impairments</p> <p>Brief Interview for Mental Status (BIMS)</p> <p>IV. B3a. Repetition of Three Words</p> <p>Ask patient: "I am going to say three words for you to remember. Please repeat the words after I have said all three. The words are: sock, blue and bed. Now tell me the three words."</p> <p>Number of words repeated by patient after first attempt: 3. Three; 2. Two; 1. One; 0. None</p> <p>After the patient's first attempt say: "I will repeat each of the three words with a cue and ask you about them later: sock, something to wear; blue, a color; bed, a piece of furniture." You may repeat the words up to two more times.</p> <p>IV. B3b. Year, Month, Day B3b.1. Ask patient: "Please tell me what year it is right now." Patient's answer is: 3. Correct; 2. Missed by 1 year; 1. Missed by 2 to 5 years; 0. Missed by more than 5 years or no answer</p>	<p>Cognitive Performance Scale (CPS) Score SNF PPS Item including</p> <p>B1. COMATOSE</p> <p>B2a. Short-term memory OK—seems/appears to recall after 5 minutes</p> <p>B4. Cognitive skills for daily decision making</p> <p>C4. Make self understood (G1ha) Eating Self-perform: How resident eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g., tube feeding, total parenteral nutrition)</p> <p>Note: See Figure 3-4 for the algorithms to calculate CPS score.</p>	<p>(M0560) Cognitive Functioning: (Patient's current level of alertness, orientation, comprehension, concentration, and immediate memory for simple commands.)</p> <p>0—Alert/oriented, able to focus and shift attention, comprehends and recalls task directions independently.</p> <p>1—Requires prompting (cuing, repetition, reminders) only under stressful or unfamiliar conditions.</p> <p>2—Requires assistance and some direction in specific situations (e.g., on all tasks involving shifting of attention), or consistently requires low stimulus environment due to distractibility.</p> <p>3—Requires considerable assistance in routine situations. Is not alert and oriented or is unable to shift attention and recall directions more than half the time.</p> <p>4—Totally dependent due to disturbances such as constant disorientation, coma, persistent vegetative state, or delirium.</p>	<p>39.R. Memory</p> <p>1—Total Assistance/prompting</p> <p>2—Maximal Assistance/prompting</p> <p>3—Moderate Assistance</p> <p>4—Minimal Assistance</p> <p>5—Supervision</p> <p>6—Modified Independence (Device)</p> <p>7—Complete Independence (Timely, Safely)</p> <p>IRF PPS Item</p>

(continued)

Table 3-11. Crosswalk for CARE Cognitive Status and Mood to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
IV. B3b.2. Ask patient: "What month are we in right now?" Patient's answer is: 2. Accurate within 5 days; 1. Missed by 6 days to 1 month; 0. Missed by more than 1 month or no answer IV. B3b.3. Ask patient: "What day of the week is today?" Patient's answer is: 2. Accurate; 1. Incorrect or no answer	Same as above	Same as above	Same as above
<p>CARE Item Name: Possible Depression Present</p> IV. F3. Ask patient: "During the past 2 weeks, how often would you say, 'I feel sad'?" 3. Often 4. Always	l. Sad, pained, worried facial expressions—e.g., furrowed brows 2. Indicator of this type exhibited daily or almost daily (6, 7 days a week) or m. Crying, tearfulness 2. Indicator of this type exhibited daily or almost daily (6, 7 days a week)	(M0590) Depressive Feelings Reported or Observed in Patient: (Mark all that apply.) 2—Sense of failure 3—Hopelessness 4—Recurrent thoughts of death 5—Thoughts of suicide	NA

(continued)

Table 3-11. Crosswalk for CARE Cognitive Status and Mood to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Expression of Ideas and Wants</p> <p>V. C1b. Expression of Ideas and Wants</p> <p>4. Expresses complex messages without difficulty and with speech that is clear and easy to understand</p> <p>3. Exhibits some difficulty with expressing needs and ideas (e.g., some words or finishing thoughts) or speech is not clear</p> <p>2. Frequently exhibits difficulty with expressing needs and ideas</p> <p>1. Rarely/Never expresses self or speech is very difficult to understand.</p> <p>8. Unable to assess</p> <p>9. Unknown</p>	<p>C4. Making self understood</p> <p>0. UNDERSTOOD</p> <p>1. USUALLY UNDERSTOOD—difficulty finding words or finishing thoughts</p> <p>2. SOMETIMES UNDERSTOOD—ability is limited to making concrete requests</p> <p>3. RARELY/NEVER UNDERSTOOD</p>	<p>(M0410) Speech and Oral (Verbal) Expression of Language (in patient's own language):</p> <p>0—Expresses complex ideas, feelings, and needs clearly, completely, and easily in all situations with no observable impairment.</p> <p>1—Minimal difficulty in expressing ideas and needs (may take extra time; makes occasional errors in word choice, grammar or speech intelligibility; needs minimal prompting or assistance).</p> <p>2—Expresses simple ideas or needs with moderate difficulty (needs prompting or assistance, errors in word choice, organization or speech intelligibility). Speaks in phrases or short sentences.</p> <p>3—Has severe difficulty expressing basic ideas or needs and requires maximal assistance or guessing by listener. Speech limited to single words or short phrases.</p> <p>4—Unable to express basic needs even with maximal prompting or assistance but is not comatose or unresponsive (e.g., speech is nonsensical or unintelligible).</p> <p>5—Patient nonresponsive or unable to speak.</p>	<p>39.O. Expression</p> <p>1—Total Assistance/prompting</p> <p>2—Maximal Assistance/prompting</p> <p>3—Moderate Assistance</p> <p>4—Minimal Assistance</p> <p>5—Supervision</p> <p>6—Modified Independence (Device)</p> <p>7—Complete Independence (Timely, Safely)</p>

NOTE: CARE, Continuity Record Assessment and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS, Outcome Assessment Information Set; PPS, prospective payment system; SNF, skilled nursing facility.

Figure 3-4. Algorithms for Calculating Cognitive Performance Scale (CPS) Score on MDS 2.0

If a resident is comatose (B1 = 1), the CPS score is 7 - Stop!
If B1 = 0, proceed to Step 1.

Step 1: Enter points for each MDS item in the table below to calculate Total A.

Instructions for Scoring Total A:

1. Review item B2a (Short-term memory). If the resident's B2a = 1, score a 1 in the box to the right.
2. Review item B4 (Cognitive skills for daily decision making). If the resident's B4 = 1 or 2, score a 1 in the box to the right.
3. Review item C4 (Making self understood). If the resident's C4 = 1, 2, or 3, score a 1 in the box to the right.
4. Calculate the total for the three boxes. The total cannot exceed 3.

Impairment Level	MDS Item	Step 1 Score
Impairment Add one point for each item	B2a = 1	<input type="checkbox"/>
	B4 = 1 or 2	<input type="checkbox"/>
	C4 = 1, 2 or 3	<input type="checkbox"/>
	Total A (0 – 3)	0

Step 2: Enter points for each MDS item in the table below to calculate Total B

Instructions for Scoring Total B:

1. Review item B4 (Cognitive skills for daily decision making). If the resident's B4 = 2, score a 1 in the box to the right.
2. Review item C4 (Making self understood). If the resident's C4 = 2 or a 3, score a 1 in the box to the right.
3. Calculate the total for the two boxes. The total cannot exceed 2.

Impairment Level	MDS Item	Step 2 Score
Severe Impairment Add one point for each item	B4 = 2	<input type="checkbox"/>
	C4 = 2 or 3	<input type="checkbox"/>
	Total B (0 – 2)	0

Step 3: Read across table (below) for MDS items B1 and B4, and Totals A and B to determine CPS score.

Instructions for Reading the Table:

1. Review the resident's MDS, items B1 and B4.
2. Note the impairment total counts from Steps 1 and 2.
3. Using the responses for B1 and B4, and Total A and Total B, read across the table to determine the CPS Score.

If B4 = 3 or more, use the resident's Eating score (G1h) to read across the table and determine the CPS score.

- If the resident's G1h = 0 – 3 (not totally dependent in eating), the CPS = 6.
- If the resident's G1h = 4 (totally dependent in eating), the CPS = 7.

MDS Item		Score Totals		MDS Item	CPS Score	
B1	B4	Total A	Total B	G1h		
0	0-2	0	0		1	Intervenable
		1	0		2	
		2-3	0		3	
		2-3	1		4	
		2-3	2		5	
1	3			0-3	6	Non-Intervenable
				4	7	

Date CPS Completed:

CPS Score:

SOURCE: Centers for Medicare & Medicaid Services Form CMS-20084 (06/07).

Table 3-12. Cross-Tabulation of Cognitive Status Measured on CARE and MDS 2.0

CARE Item: BIMS Cognitive Status	MDS 2.0 CPS Cognitive Status: 1 (Most Impaired)	MDS 2.0 CPS Cognitive Status: 2 (Moderately Impaired)	MDS 2.0 CPS Cognitive Status: 3 (Intact)	MDS 2.0 CPS Cognitive Status: Total
Missing	10	0	7	17
1 (most impaired)	319*	89	72	480
2 (moderately impaired)	104	122*	213	439
3 (intact)	65	164	1,400*	1,629
Total	498	375	1,692	2,565

NOTES: BIMS, Brief Interview for Mental Status; CARE, Continuity Assessment Record and Evaluation; CPS, Cognitive Performance Scale; MDS, Minimum Data Set. *Indicates congruence.

SOURCE: ASPERISK2_038.

On the OASIS-B, we identified the item Cognitive Functioning as the one most closely matching the CARE cognitive status item (Table 3-11, third column from left). RTI conducted analyses to compare the OASIS-B cognitive functioning score with BIMS items from CARE and empirically selected the cutoffs to match the levels of cognitive status measured by the BIMS.

Table 3-13 presents the cross-tabulation analyses of cognitive status as measured on CARE and OASIS-B. In general, categories of cognitive status defined on the basis of OASIS-B cognitive functioning showed a high level of agreement with the BIMS on CARE for patients with either most impaired or most intact cognitive status. The level of agreement for patients with moderately impaired cognitive status was low.

Table 3-13. Cross-Tabulation of Cognitive Status Measured on CARE and OASIS-B

CARE Item: BIMS Cognitive Status	OASIS-B Cognitive Status: 1 (Most Impaired)	OASIS-B Cognitive Status: 2 (Moderately Impaired)	OASIS-B Cognitive Status: 3 (Intact)	OASIS-B Cognitive Status: Total
Missing	0	1	22	23
1 (most impaired)	34*	37	67	138
2 (moderately impaired)	10	26*	208	244
3 (intact)	5	27	1,303*	1,335
Total	49	91	1,600	1,740

NOTES: BIMS, Brief Interview for Mental Status; CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. *Indicates congruence.

SOURCE: ASPERISK2_038.

Only one IRF-PAI item—Memory—was similar to the BIMS. RTI conducted analyses to compare the IRF-PAI memory score with the cognitive status measured on CARE and empirically selected the cutoffs to match the levels of cognitive status measured by the BIMS items on CARE.

Table 3-14 presents the cross-tabulation analyses between cognitive status as defined on CARE and that defined by IRF-PAI. In general, categories of cognitive status defined on the basis of the IRF-PAI memory score showed a high level of agreement with BIMS on CARE for patients with either most impaired or most intact cognitive status. The level of agreement for patients with moderately impaired cognitive status was low.

Table 3-14. Cross-Tabulation of Cognitive Status Measured on CARE and IRF-PAI

CARE Item: BIMS Cognitive Status	IRF-PAI Cognitive Status: 1 (Most Impaired)	IRF-PAI Cognitive Status: 2 (Moderately Impaired)	IRF-PAI Cognitive Status: 3 (Intact)	IRF-PAI Cognitive Status: Total
Missing	4	3	12	19
1 (most impaired)	153*	185	108	446
2 (moderately impaired)	28	241*	250	519
3 (intact)	23	254	1,305*	1,582
Total	208	683	1,675	2,566

NOTES: BIMS, Brief Interview for Mental Status; CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument.*Indicates congruence.

SOURCE: ASPERISK2_038.

Mood: Possible Depression Present

In the risk adjustment models using CARE items, RTI used an item on CARE that measures the frequency of feeling sad to define possible depression (Table 3-11). A patient who answered “often” or “always” to the question “During the past 2 weeks, how often would you say, ‘I feel sad?’” was coded as “possible depression present.”

We identified items relevant to possible depression to create the analogous variables. These items are presented in Table 3-11. No items were available in IRF-PAI to measure possible depression. The IRF-PAI item Social Interaction covers a broad variety of behaviors related to social interactions and was considered an additional assessment item from the similar domain (see **Section 3.4** for detail).

Two MDS 2.0 items were identified as analogous to the CARE item for depression. These items were Sad, pained, worried facial expressions and Crying, tearfulness. If either item was coded in the MDS 2.0, the patient was identified as having possible depression.

Table 3-15 presents the cross-tabulation analyses of possible depression as measured on CARE and MDS 2.0. The depression item on MDS 2.0 had extremely low sensitivity (0.006) when tested against the CARE item. One major difference between the MDS and CARE relates to the mode of data collection, which may partly explain the low sensitivity. The CARE item involved a patient interview, whereas the MDS 2.0 items were based on staff observation.

Table 3-15. Cross-Tabulation of Depression Measured on CARE and MDS 2.0

CARE Item: Possible Depression Present	MDS 2.0 Depression Present: No	MDS 2.0 Depression Present: Yes	MDS 2.0 Depression Present: Total	MDS 2.0 Depression Present: Sensitivity ^a	MDS 2.0 Depression Present: Specificity ^a
No	2,388	21	2,409	—	—
Yes	155	1	156	—	—
Total	2,543	22	2,565	—	—
—	—	—	—	0.006	0.991

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^aSensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Four OASIS-B items were identified as analogous to the CARE possible depression variable: Sense of failure, Hopelessness, Recurrent thoughts of death, and Thoughts of death. The providers are instructed to answer these four items on the basis of information with respect to depressive feelings either reported or observed. If any of the items were indicated, we coded possible depression as present.

Table 3-16 presents the cross-tabulation analyses of the depression item measured using CARE and using OASIS-B. Possible depression as measured using OASIS-B had extremely low sensitivity (0.049) when tested against the CARE item.

Table 3-16. Cross-Tabulation of Depression Present Measured on CARE and OASIS-B

CARE Item: Possible Depression Present	OASIS-B Depression Present: No	OASIS-B Depression Present: Yes	OASIS-B Depression Present: Total	OASIS-B Depression Present: Sensitivity ^a	OASIS-B Depression Present: Specificity ^a
No	1,642	17	1,659	—	—
Yes	77	4	81	—	—
Total	1,719	21	1,740	—	—
—	—	—	—	0.049	0.990

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^aSensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031

Expression

The risk adjustment models using CARE items included a categorical variable measuring patients' ability to express without difficulty, some difficulty, and frequent difficulty, as well as rarely or never expressing themselves. We identified analogous items on the MDS 2.0, the OASIS-B, and the IRF-PAI. These items are presented in Table 3-11.

The MDS 2.0 item Make Self Understood was identified as analogous to the CARE item for expression. RTI conducted analyses to compare the MDS 2.0 and the CARE items and empirically selected the cutoffs to match the levels of expression measured by CARE.

Table 3-17 presents the cross-tabulation analyses between the expression variable on CARE and MDS 2.0. Categories of ability to express defined based on the MDS 2.0 item showed a high level of agreement with the CARE variable.

Table 3-17. Cross-Tabulation Between Expression Measured on CARE and MDS 2.0

CARE Item: Expression	MDS 2.0 Expression: 1 (Rarely/ Never Expresses self)	MDS 2.0 Expression: 2 (Frequently Exhibits Difficulty)	MDS 2.0 Expression: 3 (Some Difficulty)	MDS 2.0 Expression: 4 (Without Difficulty)	MDS 2.0 Expression: Total
1 (rarely/never expresses self)	15*	20	7	3	45
2 (frequently exhibits difficulty)	6	54*	55	49	164
3 (some difficulty)	4	36	101*	205	346
4 (without difficulty)	1	20	78	1,889*	1,988
Missing	5	7	5	5	22
Total	31	137	246	2,151	2,565

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. *Indicates congruence.

SOURCE: ASPERISK2_038.

The OASIS-B item M0410, Speech and Oral (Verbal) Expression of Language, was identified as analogous to the CARE expression item. RTI conducted analyses to compare the OASIS-B and CARE items and empirically selected the cutoffs to match the levels of ability to express ideas and wants measured by CARE.

Table 3-18 presents the cross-tabulation analyses between expression as defined on CARE and on OASIS-B. The categories at the lowest and highest ends (Rarely/Never expresses self and Without difficulty) for OASIS-B showed a high level of agreement with CARE. The middle categories, however, showed only a moderate level of agreement.

Table 3-18. Cross-Tabulation Between Expression Measured on CARE and OASIS-B

CARE Item: Expression	OASIS-B Expression: 1 (Rarely/ Never Expresses Self)	OASIS-B Expression: 2 (Frequently Exhibits Difficulty)	OASIS-B Expression: 3 (Some Difficulty)	OASIS-B Expression: 4 (Without Difficulty)	OASIS-B Expression: Total
1 (rarely/never expresses self)	9*	8	2	0	19
2 (frequently exhibits difficulty)	2	8*	35	3	48
3 (some difficulty)	0	3	183*	40	226
4 (without difficulty)	1	4	200	1,237*	1,442
Missing	1	0	3	1	5
Total	13	23	423	1,281	1,740

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. *Indicates congruence.

SOURCE: ASPERISK2_038.

The IRF-PAI item 390, Expression, was identified as analogous to the CARE expression item. RTI conducted analyses to compare the IRF-PAI and CARE items and empirically selected the cutoffs to match the levels of ability to express ideas and wants measured by CARE.

Table 3-19 presents the cross-tabulation analyses between CARE and IRF-PAI expression items. In general, categories of ability to express defined according to the IRF-PAI item showed a moderate level of agreement with the CARE item.

Table 3-19. Cross-Tabulation Between Expression Measured on CARE and IRF-PAI

CARE Item: CARE Expression	IRF-PAI Expression: 1 (Rarely/ Never Expresses self)	IRF-PAI Expression: 2 (Frequently Exhibits Difficulty)	IRF-PAI Expression: 3 (Some Difficulty)	IRF-PAI Expression: 4 (Without Difficulty)	IRF-PAI Expression: Total
1 (rarely/never expresses self)	57*	30	12	1	100
2 (frequently exhibits difficulty)	38	43*	89	24	194
3 (some difficulty)	23	44	243*	206	516
4 (without difficulty)	25	33	298	1,375*	1,731
Missing	6	6	3	10	25
Total	149	156	645	1,616	2,566

NOTES: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument. *Indicates congruence.

SOURCE: ASPERISK2_038.

3.1.3 Medical Status

Severe Pressure Ulcers

In the risk adjustment models using CARE items, the severe pressure ulcer indicator was defined as the presence of one or more pressure ulcers at stage 3 or 4, or of any stage 2 pressure ulcers that persisted for more than a month. **Table 3-20** presents the crosswalk for the CARE severe pressure ulcer item to the MDS 2.0, OASIS-B, and IRF-PAI.

The MDS 2.0 item M2a, Pressure ulcer, was identified as analogous to the CARE severe pressure ulcer item. This MDS 2.0 item recorded the highest stage for the patient's pressure ulcers in the last 7 days. If the item had a value greater than or equal to 3, we defined severe pressure ulcer as Yes. **Table 3-21** presents the cross-tabulation analyses of severe pressure ulcer defined using CARE compared with MDS 2.0. The severe pressure ulcer as defined using MDS 2.0 had moderate sensitivity (0.567) and high specificity (0.990) when tested against CARE. Out of 60 patients with severe pressure ulcers present as defined by CARE, 34 had severe pressure ulcers on MDS 2.0. The potential underestimating using MDS 2.0 may be due to the differences in the definitions. The CARE item included pressure ulcers at stage 2 for more than a month as severe pressure ulcers, whereas the MDS 2.0 analogue did not use pressure ulcers at stage 2 because MDS 2.0 does not identify duration for pressure ulcers at stage 2.

Table 3-20. Crosswalk for CARE Medical Status to MDS 2.0, OASIS-B, and IRF-PAI

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>CARE Item Name: Severe Pressure Ulcer Pressure ulcer at stage 2, stage 3, stage 4, or unstageable: III. G2b. Stage 3—Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, or muscles are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. > 0 or III. G2c. Stage 4—Full thickness tissue loss with visible bone, tendon, or muscle. Slough or eschar may be present on some parts of the wound bed. Often includes undermining and tunneling. > 0 or III. G2d. Unstageable—Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, gray, green, or brown) or eschar (tan, brown, or black) in the wound bed. Include ulcers that are known or likely, but are not stageable due to nonremovable dressing, device, cast or suspected deep tissue injury in evolution. > 0 or III. G2e. Number of unhealed stage 2 ulcers known to be present for more than 1 month.</p>	<p>M2a. Pressure ulcer the highest state in the last 7 days \geq 3 SNF PPS Item</p>	<p>(M0450) Current Number of Pressure Ulcers at Each Stage: Stage 3: Full-thickness skin loss involving damage or necrosis of subcutaneous tissue which may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue. > 0 or Stage 4: Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint capsule, etc.) > 0 or Unstageable: In addition to the above, is there at least one pressure ulcer that cannot be observed due to the presence of eschar or a nonremovable dressing, including casts? 1. Yes HHA PPS Item</p>	<p>NA^a</p>

(continued)

Table 3-20. Crosswalk for CARE Medical Status to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>If the patient has one or more unhealed stage 2 pressure ulcers, record the number present today that were first observed more than 1 month ago, according to the best available records.</p> <p>If the patient has no unhealed stage 2 pressure ulcers, record "0." If the patient has 8 or more unhealed stage 2 pressure ulcers, record "8." If unknown, record "9."</p> <p>> 0</p>	Same as above	Same as above	Same as above
<p>CARE Item Name: Major Wounds Present</p> <p>III. G5a. Delayed healing of surgical wound > 0 or III. G5b. Trauma-related wound (e.g., burns) > 0 or III. G5c. Diabetic foot ulcer(s) > 0 or III. G5d. Vascular ulcer (arterial or venous including diabetic ulcers not located on the foot) > 0</p>	<p>M2b. Stasis ulcer—open lesion caused by poor circulation in the lower extremities</p> <p>>0 or M4b. Burns (second or third degree)</p>	<p>(M0468) Does this patient have a Stasis Ulcer? 1—Yes</p> <p>HHA PPS Item</p> <p>or (M0482) Does this patient have a Surgical Wound? 1—Yes</p> <p>& (M0488) Status of Most Problematic (Observable) Surgical Wound: 3—Not healing</p>	NA
<p>CARE Item Name: Respiratory Status—Impaired</p> <p>V. F1a. With Supplemental O2: Respiratory Status: Was the patient dyspneic or noticeably short of breath?</p> <p>5. Severe, with evidence the patient is struggling to breathe at rest</p>	<p>J1b. Inability to lie flat due to shortness of breath</p> <p>or J1l. Shortness of breath</p>	<p>(M0500) Respiratory Treatments utilized at home: 1—Oxygen (intermittent or continuous)</p> <p>& (M0490) When is the patient dyspneic or noticeably Short of Breath?</p>	NA ^b

(continued)

Table 3-20. Crosswalk for CARE Medical Status to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
<p>4. Mild at rest (during day or night)</p> <p>3. With minimal exertion (e.g., while eating, talking, or performing other ADLs [activities of daily living]) or with agitation</p> <p>2. With moderate exertion (e.g., while dressing, using commode or bedpan, walking between rooms)</p> <p>1. When climbing stairs</p> <p>or</p> <p>V. F1b. Without Supplemental O2: Respiratory Status:</p> <p>5. Severe, with evidence the patient is struggling to breathe at rest</p> <p>4. Mild at rest (during day or night)</p> <p>3. With minimal exertion (e.g., while eating, talking, or performing other ADLs) or with agitation</p>	Same as above	<p>4—At rest (during day or night)</p> <p>3—With minimal exertion (e.g., while eating, talking, or performing other ADLs) or with agitation</p> <p>or</p> <p>(M0490) When is the patient dyspneic or noticeably Short of Breath?</p> <p>1—When walking more than 20 feet, climbing stairs</p> <p>2—With moderate exertion (e.g., while dressing, using commode or bedpan, walking distances less than 20 feet)</p> <p>3—With minimal exertion (e.g., while eating, talking, or performing other ADLs) or with agitation</p> <p>4—At rest (during day or night)</p>	Same as above
<p>CARE Item Name: Ventilator (Weaning or Non-Weaning)</p> <p>III. D14. Ventilator—Weaning</p> <p>III. D15. Ventilator—Non-Weaning</p>	P1aI. Ventilator or respirator SNF PPS Item	<p>(M0500) Respiratory Treatments utilized at home: (Mark all that apply.)</p> <p>2—Ventilator (continually or at night)</p>	NA

(continued)

Table 3-20. Crosswalk for CARE Medical Status to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
CARE Item Name: Hemodialysis III. D16. Hemodialysis	P1ab. Dialysis SNF PPS Item	NA	ICD-9-CM code
CARE Item Name: Total Parenteral Nutrition [TPN] III. D3. Total Parenteral Nutrition	K5a. Parenteral/IV [intravenous] & K6a. the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days 4. 76% to 100%	(M0250)Therapies the patient receives at home: 2—Parenteral nutrition (TPN or lipids)	NA
CARE Item Name: Central Line Management III. D4. Central Line Management	NA	NA	NA
CARE Item Name: History of Falls II. B7. History of Falls. Has the patient had two or more falls in the past year or any fall with injury in the past year? 1. Yes	J4a. Fell in past 30 days or J4b. Fell in past 31–180 days or J4c. Hip fracture in last 180 days or J4d. Other fracture in last 180 days	NA	NA
CARE Item Name: Swallowing symptoms V. B1a. Complaints of difficulty or pain with swallowing or V. B1b. Coughing or choking during meals or when swallowing medications or V. B1c. Holding food in mouth/cheeks or residual food in mouth after meals or V. B1d. Loss of liquids/solids from mouth when eating or drinking	K1b. Swallowing problem	NA	NA ^c

(continued)

Table 3-20. Crosswalk for CARE Medical Status to MDS 2.0, OASIS-B, and IRF-PAI (continued)

CARE Items and Definitions	Analogous Items and Definitions MDS 2.0	Analogous Items and Definitions OASIS-B	Analogous Items and Definitions IRF-PAI
CARE Item Name: Swallowing NPO V. B1e. NPO: intake not by mouth	K5b. Feeding tube SNF PPS Item & K6a. the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days 4. 76% to 100%	(M0250)Therapies the patient receives at home: 3—Enteral nutrition (nasogastric, gastrostomy, jejunostomy, or any other artificial entry into the alimentary canal)	NA
CARE Item Name: Turning Surfaces—At Least One Not Intact III. G6. Turning surfaces not intact	NA	NA	NA
CARE Item Name: Sitting Endurance: No, could not do V. G1b. Sitting endurance: Was the patient able to tolerate sitting for 15 minutes?	NA	NA	NA
CARE Item Name: Sitting Endurance: Yes, can do with support V. G1b. Sitting endurance: Was the patient able to tolerate sitting for 15 minutes?	NA	NA	NA
CARE Item Name: Sitting Endurance: Not assessed due to medical restriction V. G1b. Sitting endurance: Was the patient able to tolerate sitting for 15 minutes?	NA	NA	NA

NOTES: CARE, Continuity Assessment Record and Evaluation; HHA, home health agency; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; PPS, prospective payment system; SNF, skilled nursing facility.

^a Crosswalk not available because IRF-PAI item 52A, Highest current pressure ulcer stage, is an optional item and has a missing rate of 70%.

^b Crosswalk not available because IRF-PAI items 48, Shortness of breath with exertion, and 49, Shortness of breath at rest, are optional items and have a joint missing rate of 65%.

^c Crosswalk not available because IRF-PAI item 57, Swallowing status, is an optional item and has a missing rate of 55%.

Table 3-21. Cross-Tabulation Between Severe Pressure Ulcer on CARE and MDS 2.0

CARE Item : Severe Pressure Ulcer	MDS 2.0 Severe Pressure Ulcer: No	MDS 2.0 Severe Pressure Ulcer: Yes	MDS 2.0 Severe Pressure Ulcer: Total	MDS 2.0 Severe Pressure Ulcer: Sensitivity ^a	MDS 2.0 Severe Pressure Ulcer: Specificity ^a
No	2,481	24	2,505	—	—
Yes	26	34	60	—	—
Total	2,507	58	2,565	—	—
—	—	—	—	0.567	0.990

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Three OASIS-B items were identified as analogous to the CARE severe pressure ulcer item: current number of stage 3, stage 4, or unstageable pressure ulcers. If any of the items indicated pressure ulcers, we defined severe pressure ulcer as Yes. **Table 3-22** presents the cross-tabulation analyses between the severe pressure ulcer item defined on CARE and that defined by OASIS-B. The severe pressure ulcer item defined using OASIS-B had low sensitivity (0.389) and high specificity (0.997) when tested against CARE.

Table 3-22. Cross-Tabulation Between Severe Pressure Ulcer on CARE and OASIS-B

CARE Item: Severe Pressure Ulcer	OASIS-B Severe Pressure Ulcer: No	OASIS-B Severe Pressure Ulcer: Yes	OASIS-B Severe Pressure Ulcer: Total	OASIS-B Severe Pressure Ulcer: Sensitivity ^a	OASIS-B Severe Pressure Ulcer: Specificity ^a
No	1,716	6	1,722	—	—
Yes	11	7	18	—	—
Total	1,727	13	1,740	—	—
—	—	—	—	0.389	0.997

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

IRF-PAI had two items measuring pressure ulcers at admission, one measuring the highest stage and one measuring the number. However, these two items were optional/voluntary and had a missing rate of 70%, revealed by RTI's analyses.⁸ For this reason, we did not

⁸ SOURCE: ASPERISK2_024.

consider the IRF-PAI items as analogous to CARE severe pressure ulcer for the purposes of our analysis.

Major Wounds Present

The CARE major wounds present variable was defined as the presence of delayed healing of surgical wounds, trauma-related wounds, diabetic foot ulcers, or vascular ulcers. Analogous items were identified in MDS 2.0 and OASIS-B. No analogous item was identified in IRF-PAI.

Two MDS 2.0 items were identified as analogous to CARE major wounds present: M2b, Stasis ulcer, and M4b, Burns (second or third degree) (Table 3-20). If the items indicated that either type of wound was present, we defined major wounds present as Yes.

Table 3-23 presents the cross-tabulation analyses between the major wounds present variable as defined in CARE and as defined by MDS 2.0. The major wounds present item defined using MDS 2.0 had low sensitivity (0.212) and high specificity (0.991) when tested against CARE.

Table 3-23. Cross-Tabulation Between Major Wounds Present on CARE and MDS 2.0

CARE Item: Major Wounds Present	MDS 2.0 Major Wounds Present: No	MDS 2.0 Major Wounds Present: Yes	MDS 2.0 Major Wounds Present: Total	MDS 2.0 Major Wounds Present: Sensitivity ^a	MDS 2.0 Major Wounds Present: Specificity ^a
No	2,397	22	2,419	—	—
Yes	115	31	146	—	—
Total	2,512	53	2,565	—	—
—	—	—	—	0.212	0.991

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Three OASIS-B items were identified as analogous to the CARE major wounds present variable: M0468, Stasis ulcer; M0482, Surgical wound; and M0488, Status of Most Problematic (Observable) Surgical Wound. If these items indicated at least one stasis ulcer or at least one surgical wound that was not healing, major wounds present was defined as Yes. **Table 3-24** presents the cross-tabulation analyses of the major wounds item defined using CARE and OASIS-B. The major wounds present variable defined using OASIS-B had low sensitivity (0.312) and high specificity (0.948) when tested against CARE.

Table 3-24. Cross-Tabulation Between Major Wounds Present on CARE and OASIS-B

CARE Item: Major Wounds Present	OASIS-B Major Wounds Present: No	OASIS-B Major Wounds Present: Yes	OASIS-B Major Wounds Present: Total	OASIS-B Major Wounds Present: Sensitivity ^a	OASIS-B Major Wounds Present: Specificity ^a
No	1,489	81	1,570	—	—
Yes	117	53	170	—	—
Total	1,606	134	1,740	—	—
—	—	—	—	0.312	0.948

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Respiratory Status

In the risk adjustment models using CARE variables, patients were considered impaired if they were using supplemental oxygen. Patients with no oxygen use reported were considered impaired if they were short of breath or dyspneic with minimal or less exertion. Patients on ventilators were included in a separate category.

Two MDS 2.0 items were identified as analogous to CARE Respiratory Status—Impaired: J1b, Inability to lie flat due to shortness of breath, and J1l, Shortness of breath. If either item was checked, Respiratory Status—Impaired was defined as Yes. **Table 3-25** presents the cross-tabulation analyses between the respiratory status item defined using CARE or MDS 2.0. Respiratory Status—Impaired defined using MDS 2.0 had moderate sensitivity (0.464) and high specificity (0.919) when tested against CARE.

Table 3-25. Cross-Tabulation Between Respiratory Status—Impaired on CARE and MDS 2.0

CARE Item: Respiratory Status— Impaired	MDS 2.0 Respiratory Status— Impaired: No	MDS 2.0 Respiratory Status— Impaired: Yes	MDS 2.0 Respiratory Status— Impaired: Total	MDS 2.0 Respiratory Status— Impaired: Sensitivity ^a	MDS 2.0 Respiratory Status— Impaired: Specificity ^a
No	1,930	169	2,099	—	—
Yes	250	216	466	—	—
Total	2,180	385	2,565	—	—
—	—	—	—	0.464	0.919

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Two OASIS-B items were identified as analogous to CARE Respiratory Status—Impaired: M0500, Oxygen (intermittent or continuous), and M0490, When is the patient dyspneic or noticeably Short of Breath? We used the logic similar to the CARE definition to define OASIS-B Respiratory Status—Impaired. Patients were considered impaired if they used oxygen treatments and were dyspneic or noticeably short of breath with minimal or less exertion. Patients with no oxygen use were considered impaired if they were dyspneic or noticeably short of breath when walking more than 20 feet, climbing stairs, or exerting themselves moderately or less. **Table 3-26** presents the cross-tabulation analyses between Respiratory Status—Impaired as defined on CARE and as defined on OASIS-B. OASIS-B Respiratory Status—Impaired had high sensitivity (0.719) and high specificity (0.917) when tested against CARE.

IRF-PAI had two items measuring respiratory status at admission, one measuring shortness of breath with exertion and one measuring shortness of breath at rest. However, these two items were optional/voluntary, and analysis of these variables indicated a missing rate of 65%.⁹ Because of the high rate of missing values for these variables in IRF-PAI, we did not consider these variables as analogous to the CARE variables for the purposes of running our analyses.

Table 3-26. Cross-Tabulation Between Respiratory Status—Impaired on CARE and OASIS-B

CARE Item: Respiratory Status— Impaired	OASIS-B Respiratory Status— Impaired: No	OASIS-B Respiratory Status— Impaired: Yes	OASIS-B Respiratory Status— Impaired: Total	OASIS-B Respiratory Status— Impaired: Sensitivity*	OASIS-B Respiratory Status— Impaired: Specificity*
No	1,200	109	1,309	—	—
Yes	121	310	431	—	—
Total	1,321	419	1,740	—	—
—	—	—	—	0.719	0.917

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Ventilator

The definition of ventilator on CARE included both weaning and nonweaning. Analogous items were identified only in MDS 2.0 and OASIS-B (Table 3-20). Ventilator was coded as Yes if the MDS 2.0 item P1aI, Ventilator or respirator, was checked. **Table 3-27** presents the cross-tabulation analyses between ventilator as defined on CARE and as defined by MDS 2.0. The MDS 2.0 ventilator item had perfect sensitivity (1.000) and high specificity

⁹ SOURCE: ASPERISK2_024

Table 3-27. Cross-Tabulation Between Ventilator Use on CARE and MDS 2.0

CARE Item: Ventilator	MDS 2.0 Ventilator: No	MDS 2.0 Ventilator: Yes	MDS 2.0 Ventilator: Total	MDS 2.0 Ventilator: Sensitivity ^a	MDS 2.0 Ventilator: Specificity ^a
No	2,539	23	2,562	—	—
Yes	0	3	3	—	—
Total	2,539	26	2,565	—	—
—	—	—	—	1.000	0.991

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE variable as the standard.

SOURCE: ASPERISK2_031.

(0.917) when tested against CARE. All three patients with ventilators on CARE were also identified as using ventilators on the MDS 2.0. However, the MDS 2.0 ventilator item had a higher number of patients reported as using ventilators. For example, 23 patients not identified as using ventilators on CARE were identified as using ventilators on MDS 2.0.

Ventilator was coded as Yes on the OASIS-B if item M0500 Ventilator (continually or at night), was checked. **Table 3-28** presents the cross-tabulation analyses on the ventilator item based on CARE and OASIS-B. No beneficiaries using HHA were identified as using a ventilator according to the CARE definition. One beneficiary was identified as using a ventilator according to OASIS-B. The specificity of the OASIS-B ventilator item was high (0.999) when tested against CARE, but this result was due mainly to the low prevalence of ventilator use.

Table 3-28. Cross-Tabulation Between Ventilator on CARE and OASIS-B

CARE Item: Ventilator	OASIS-B Ventilator: No	OASIS-B Ventilator: Yes	OASIS-B Ventilator: Total	OASIS-B Ventilator: Sensitivity ^a	OASIS-B Ventilator: Specificity ^a
No	1,739	1	1,740	—	—
Yes	0	0	0	—	—
Total	1,739	1	1,740	—	—
—	—	—	—	NA	0.999

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Major Treatment: Hemodialysis

The CARE hemodialysis item indicated whether the patient received hemodialysis at the start of the PAC episode. Analogous items were identified only in MDS 2.0 and IRF-PAI (Table 3-20). The MDS 2.0 hemodialysis item was coded as Yes if the MDS 2.0 item P1ab, Dialysis, was checked. **Table 3-29** presents the cross-tabulation analyses between

Table 3-29. Cross-Tabulation Between Hemodialysis on CARE and MDS 2.0

CARE Item: Hemodialysis	MDS 2.0 Hemodialysis: No	MDS 2.0 Hemodialysis: Yes	MDS 2.0 Hemodialysis: Total	MDS 2.0 Hemodialysis: Sensitivity^a	MDS 2.0 Hemodialysis: Specificity^a
No	2,470	11	2,481	—	—
Yes	0	34	34	—	—
Missing	49	1	50	—	—
Total	2,519	46	2,565	—	—
—	—	—	—	1.000	0.996

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

hemodialysis as defined using CARE and using MDS 2.0. The MDS 2.0 hemodialysis item had perfect sensitivity (1.000) and high specificity (0.996) when tested against CARE. All 34 patients who received hemodialysis according to CARE were also identified as receiving hemodialysis in MDS 2.0. Eleven beneficiaries who were identified as receiving hemodialysis on MDS 2.0 were not identified as receiving hemodialysis according to CARE.

Hemodialysis on IRF-PAI was coded as Yes if the ICD-9 code V45.1 was present. We used the ICD-9 code on IRF-PAI for defining hemodialysis because hemodialysis is used in the IRF PPS system and therefore we expect that the associated ICD-9 code will be recorded on IRF-PAI when the patient receives hemodialysis. **Table 3-30** presents the cross-tabulation analyses between hemodialysis defined on CARE and on IRF-PAI. Hemodialysis defined using IRF-PAI had low sensitivity (0.118) but perfect specificity (1.000) when tested against CARE.

Table 3-30. Cross-Tabulation Between Hemodialysis on CARE and IRF-PAI

CARE Item: Hemodialysis	IRF-PAI Hemodialysis: No	IRF-PAI Hemodialysis: Yes	IRF-PAI Hemodialysis: Total	IRF-PAI Hemodialysis: Sensitivity^a	IRF-PAI Hemodialysis: Specificity^a
No	2,476	1	2,477	—	—
Yes	45	6	51	—	—
Missing	38	0	38	—	—
Total	2,559	7	2,566	—	—
—	—	—	—	0.118	1.000

NOTES: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Major Treatment: Total Parenteral Nutrition

The risk adjustment models using CARE variables included a dichotomous variable indicating whether the patient received total parenteral nutrition (TPN) at the start of the PAC episode. Analogous items were identified only in MDS 2.0 and OASIS-B (Table 3-20). TPN was coded as Yes if the MDS 2.0 item K5a, Parenteral/IV, was checked and K6a indicated that the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days was 76–100%. **Table 3-31** presents the cross-tabulation analyses between the use of TPN according to CARE and according to MDS 2.0. TPN as measured using MDS 2.0 had moderate sensitivity (0.667) and high specificity (0.998) when tested against CARE.

Table 3-31. Cross-Tabulation Between Total Parenteral Nutrition on CARE and MDS 2.0

CARE Item: Total Parenteral Nutrition	MDS 2.0 TPN: No	MDS 2.0 TPN: Yes	MDS 2.0 TPN: Total	MDS 2.0 TPN: Sensitivity ^a	MDS 2.0 TPN: Specificity ^a
No	2,504	5	2,509	—	—
Yes	2	4	6	—	—
Missing	49	1	50	—	—
Total	2,555	10	2,565	—	—
—	—	—	—	0.667	0.998

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set; TPN, total parenteral nutrition. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_074.

TPN as defined by OASIS-B was coded as Yes if M0250, Therapies the patient receives at home, indicated parenteral nutrition (TPN or lipids). No patients were identified as receiving TPN according to OASIS-B. This result is consistent with the extremely low prevalence of TPN as measured by CARE. Only one patient received TPN according to CARE.¹⁰

History of Falls

The CARE history of falls item indicated whether the patient had two or more falls in the past year or any fall with injury in the past year. Analogous items were identified only in the MDS 2.0 (Table 3-20). Four MDS 2.0 items were identified as analogous to the CARE history of falls item: J4a, Fell in past 30 days; J4b, Fell in past 31–180 days; J4c, Hip fracture in last 180 days; and J4d, Other fracture in last 180 days. If any of the items was checked, we defined history of falls as Yes. **Table 3-32** presents the cross-tabulation analyses between history of falls as defined in CARE and as defined by MDS 2.0. The MDS 2.0 item had high sensitivity (0.748) and specificity (0.814) when tested against CARE.

¹⁰ SOURCE: ASPERISK2_075

Table 3-32. Cross-Tabulation Between History of Falls on CARE and MDS 2.0

CARE Item: History of Falls	MDS 2.0 History of Falls: No	MDS 2.0 History of Falls: Yes	MDS 2.0 History of Falls: Total	MDS 2.0 History of Falls: Sensitivity ^a	MDS 2.0 History of Falls: Specificity ^a
No	1,178	270	1,448	—	—
Yes	281	836	1,117	—	—
Total	1,459	1,106	2,565	—	—
—	—	—	—	0.748	0.814

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_031.

Swallowing

Two CARE items measuring swallowing were included in the risk adjustment models: swallowing symptoms and inability to swallow (nothing by mouth, or NPO). Analogous items for both CARE variables were identified in MDS 2.0 (Table 3-20). An analogous item for swallowing NPO was identified in OASIS-B.

The CARE item for swallowing symptoms included

- complaints of difficulty or pain with swallowing,
- coughing or choking during meals or when swallowing medications,
- holding food in the mouth or cheeks or having residual food in the mouth after meals, and
- loss of liquids or solids from the mouth when eating or drinking.

Only one item measures swallowing symptoms in the MDS 2.0: K1b, Swallowing problem. Swallowing symptoms was defined as Yes if this MDS 2.0 item was checked. **Table 3-33** presents the cross-tabulation analyses between swallowing symptoms as defined on CARE and on the MDS 2.0. The MDS 2.0 swallowing symptoms had moderate sensitivity (0.608) and high specificity (0.919) when tested against CARE.

Two MDS 2.0 items were identified as analogous to the CARE swallowing NPO item: K5b, Feeding tube, and K6a, the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days. If the feeding tube item was checked and the calories intake item indicated that 76–100% of the total calories the patient received were through parenteral or tube feedings, we defined swallowing NPO as Yes. **Table 3-34** presents the cross-tabulation analyses between swallowing NPO as defined on CARE and as defined on the MDS 2.0. The MDS 2.0 swallowing NPO variable had high sensitivity (0.879) and specificity (0.997) when tested against CARE.

Table 3-33. Cross-Tabulation Between Swallowing Symptoms on CARE and MDS 2.0

CARE Item: Swallowing Symptoms	MDS 2.0 Swallowing Symptoms: No	MDS 2.0 Swallowing Symptoms: Yes	MDS 2.0 Swallowing Symptoms: Total	MDS 2.0 Swallowing Symptoms: Sensitivity ^a	MDS 2.0 Swallowing Symptoms: Specificity ^a
No	2,242	198	2,440	—	—
Yes	49	76	125	—	—
Total	2,291	274	2,565	—	—
—	—	—	—	0.608	0.919

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Table 3-34. Cross-Tabulation Between Swallowing NPO on CARE and MDS 2.0

CARE Item: Swallowing NPO	MDS 2.0 Swallowing NPO: No	MDS 2.0 Swallowing NPO: Yes	MDS 2.0 Swallowing NPO: Total	MDS 2.0 Swallowing NPO: Sensitivity ^a	MDS 2.0 Swallowing NPO: Specificity ^a
No	2,520	8	2,528	—	—
Yes	4	29	33	—	—
Missing	4	0	4	—	—
Total	2,528	37	2,565	—	—
—	—	—	—	0.879	0.997

NOTES: CARE, Continuity Assessment Record and Evaluation; MDS, Minimum Data Set; NPO, nothing by mouth. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_038.

Swallowing NPO was coded as Yes using OASIS-B if M0250, Therapies the patient receives at home, was marked as 3—Enteral nutrition (nasogastric, gastrostomy, jejunostomy, or any other artificial entry into the alimentary canal). **Table 3-35** presents the cross-tabulation analyses between Swallowing NPO as defined on CARE and on the OASIS-B. The OASIS-B Swallowing NPO variable had high sensitivity (0.818) and specificity (0.994) when tested against CARE.

No analogous items were identified in the MDS 2.0, OASIS-B, or IRF-PAI for five CARE items including Central Line management; Turning Surfaces—At Least One Not Intact; Sitting Endurance: No, could not do; Sitting Endurance: Yes, can do with support; and Sitting Endurance: Not assessed due to medical restriction. Note also that primary medical diagnoses and comorbid condition categories were not included in the item replacement crosswalks because these were claims-based, rather than assessment-based, variables.

Table 3-35. Cross-Tabulation Between Swallowing NPO on CARE and OASIS-B

CARE Item: Swallowing NPO	OASIS-B swallowing NPO: No	OASIS-B swallowing NPO: Yes	OASIS-B swallowing NPO: Total	OASIS-B swallowing NPO:	OASIS-B swallowing NPO: Specificity ^a
No	1,718	10	1,728	—	—
Yes	2	9	11	—	—
Missing	1	0	1	—	—
Total	1,721	19	1,740	—	—
—	—	—	—	0.818	0.994

NOTES: CARE, Continuity Assessment Record and Evaluation; OASIS-B, Outcome Assessment Information Set; NPO, nothing by mouth. ^a Sensitivity and specificity were calculated using the CARE item as the standard.

SOURCE: ASPERISK2_075.

Table 3-36 presents the descriptive statistics for the CARE items and their analogues in MDS 2.0, OASIS-B, and IRF-PAI.

Table 3-36. Descriptive Statistics: CARE, MDS 2.0, OASIS-B, and IRF-PAI

Variable Name	CARE: SNF N	CARE: SNF Percent/ Mean (SD)	MDS 2.0: SNF N	MDS 2.0: SNF Percent/ Mean(SD)	CARE : HHA N	CARE: HHA Percent/ Mean(SD)	OASIS-B: HHA N	OASIS-B: HHA Percent/ Mean(SD)	CARE: IRF N	CARE: IRF Percent/ Mean(SD)	IRF-PAI: IRF N	IRF-PAI: IRF Percent/ Mean(SD)
Function												
Mean motor score at admission (SD)	2,565	60.1 (18.3) ^a	2,565	38.4 (9.7) ^b	1,740	87.4 (23.3) ^a	1,740	8.2 (4.6) ^c	2,566	57.3 (16.6) ^a	2,566	28.3 (9.2) ^d
Prior functioning- self care function: dependent												
No	—	—	—	—	1,646	94.6	1,642	94.4	—	—	—	—
Yes	—	—	—	—	94	5.4	98	5.6	—	—	—	—
Total	—	—	—	—	1,740	100.0	1,740	100.0	—	—	—	—
Prior functioning- mobility: (ambulation/ wheelchair): dependent												
No	—	—	—	—	1,574	90.5	1,578	90.7	—	—	—	—
Yes	—	—	—	—	166	9.5	162	9.3	—	—	—	—
Total	—	—	—	—	1,740	100.0	1,740	100.0	—	—	—	—
Bowel: indwelling or external device used												
No	2,507	97.7	2,516	98.1	1,719	98.8	1,713	98.4	—	—	—	—
Yes	58	2.3	49	1.9	21	1.2	27	1.6	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—
Bladder: incontinence												
No	1,739	67.8	1,386	54.0	1,327	76.3	1,264	72.6	1,498	58.4	2,202	85.8
Yes	826	32.2	1,179	46.0	413	23.7	476	27.4	1,068	41.6	364	14.2
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	2,566	100.0	2,566	100.0
Cognitive status												
Cognitive status (Brief Interview for Mental Status [BIMS])												
Most impaired	480	18.7	498	19.4	138	7.9	49	2.8	446	17.4	208	8.1
Moderately impaired	439	17.1	375	14.6	244	14.0	91	5.2	519	20.2	683	26.6
Intact	1,629	63.5	1692	66.0	1,335	76.7	1,600	92.0	1,582	61.7	1,675	65.3
Missing	17	0.7	0	0.0	23	1.3	0	0.0	19	0.7	0	0.0
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	2,566	100.0	2,566	100.0

(continued)

Table 3-36. Descriptive Statistics: CARE, MDS 2.0, OASIS-B, and IRF-PAI (continued)

Variable Name	CARE : SNF N	CARE: SNF Percent/ Mean	MDS 2.0: SNF N	MDS 2.0: SNF Percent/ Mean	CARE: HHA N	CARE: HHA Percent/ Mean	OASIS-B: HHA N	OASIS-B: HHA Percent/ Mean	CARE: IRF N	CARE: IRF Percent/ Mean	IRF-PAI: IRF N	IRF-PAI: IRF Percent/ Mean
Possible depression present												
No	2,409	93.9	2,543	99.1	1,659	95.3	1,719	98.8	—	—	—	—
Yes	156	6.1	22	0.9	81	4.7	21	1.2	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—
Expression												
Rarely/never expresses self	45	1.8	31	1.2	19	1.1	13	0.7	100	3.9	149	5.8
Frequent difficulty	164	6.4	137	5.3	48	2.8	23	1.3	194	7.6	156	6.1
Some difficulty	346	13.5	246	9.6	226	13.0	423	24.3	516	20.1	645	25.1
Without difficulty	1,988	77.5	2151	83.9	1,442	82.9	1,281	73.6	1,731	67.5	1,616	63.0
Missing	22	0.9	0	0.0	5	0.3	0	0.0	25	1.0	0	0.0
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	2,566	100.0	2,566	100.0
Medical status												
Severe pressure ulcer present (stage, 3, 4, unstageable or stage 2 > 1 month)												
No	2,505	97.7	2,507	97.6	1,722	99.0	1,727	99.3	—	—	—	—
Yes	60	2.3	58	2.3	18	1.0	13	0.7	—	—	—	—
Total	2,565	100.0	2,565	99.9	1,740	100.0	1,740	100.0	—	—	—	—
Major wounds present												
No	2,419	94.3	2,512	97.9	1,570	90.2	1,606	92.3	—	—	—	—
Yes	146	5.7	53	2.1	170	9.8	134	7.7	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—

(continued)

Table 3-36. Descriptive Statistics: CARE, MDS 2.0, OASIS-B, and IRF-PAI (continued)

Variable Name	CARE: SNF N	CARE: SNF Percent/ Mean	MDS 2.0: SNF N	MDS 2.0: SNF Percent/ Mean	CARE: HHA N	CARE: HHA Percent/ Mean	OASIS-B: HHA N	OASIS-B: HHA Percent/ Mean	CARE: IRF N	CARE: IRF Percent/ Mean	IRF-PAI: IRF N	IRF-PAI: IRF Percent/ Mean
Respiratory status— impaired												
No	2,099	81.8	2,180	85.0	1,309	75.2	1,321	75.9	—	—	—	—
Yes	466	18.2	385	15.0	431	24.8	419	24.1	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—
Ventilator (weaning or nonweaning)												
No	2,562	99.9	2,539	99.0	1,740	100.0	1,739	99.9	—	—	—	—
Yes	3	0.1	26	1.0	0	0.0	1	0.1	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—
Major treatment: hemodialysis												
No	2,481	96.7	2,519	98.2	—	—	—	—	2,477	96.5	2,559	99.7
Yes	34	1.3	46	1.8	—	—	—	—	51	2.0	7	0.3
Missing	50	2.0	0	0.0	—	—	—	—	38	1.5	0	0.0
Total	2,565	100.0	2,565	100.0	—	—	—	—	2,566	100.0	2,566	100.0
Major treatment: total parenteral nutrition												
No	2,509	97.8	2,555	99.6	1,715	98.6	1,740	100.0	—	—	—	—
Yes	6	0.2	10	0.4	1	0.1	0	0.0	—	—	—	—
Missing	50	1.9	0	0.0	24	1.4	0	0.0	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—
History of falls												
No	1,448	56.5	1,459	56.9	—	—	—	—	—	—	—	—
Yes	1,117	43.6	1,106	43.1	—	—	—	—	—	—	—	—
Total	2,565	100.0	2,565	100.0	—	—	—	—	—	—	—	—
Swallowing symptoms												
No	2,440	95.1	2,291	89.2	—	—	—	—	—	—	—	—
Yes	125	4.9	274	10.7	—	—	—	—	—	—	—	—
Total	2,565	100.0	2,565	99.8	—	—	—	—	—	—	—	—

(continued)

Table 3-36. Descriptive Statistics: CARE, MDS 2.0, OASIS-B, and IRF-PAI (continued)

Variable Name	CARE: SNF N	CARE: SNF Percent/ Mean	MDS 2.0: SNF N	MDS 2.0: SNF Percent/ Mean	CARE: HHA N	CARE: HHA Percent/ Mean	OASIS-B: HHA N	OASIS-B: HHA Percent/ Mean	CARE: IRF N	CARE: IRF Percent/ Mean	IRF-PAI: IRF N	IRF-PAI: IRF Percent/ Mean
Swallowing: NPO (nothing by mouth)												
No	2,528	98.6	2,528	98.5	1,728	99.3	1721	98.9	—	—	—	—
Yes	33	1.3	37	1.4	11	0.6	19	1.1	—	—	—	—
Missing	4	0.2	0	0.0	1	0.1	0	0.0	—	—	—	—
Total	2,565	100.0	2,565	100.0	1,740	100.0	1,740	100.0	—	—	—	—

NOTES: CARE, Continuity Record Assessment and Evaluation; HHA, home health agency; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; SNF, skilled nursing facility.

A “—” indicates that the crosswalked variable is not available.

^a The range of CARE motor score was 22 to 132.

^b The range of MDS 2.0 motor score was 0 to 63.

^c The range of OASIS-B motor score was 0 to 29.

^d The range of IRF-PAI/FIM® motor score was 10 to 70.

SOURCE: ASPERISK2_031; ASPERISK2_038; ASPERISK2_074; ASPERISK2_075; ASPERISK2_175; ASPERISK2_176; ASPERISK2_177.

3.3 Item Crosswalk Limitations

Although most analogous items in current assessment instruments appeared to be close matches to CARE variables conceptually, RTI's analyses showed differences in values between the CARE items and their analogues. In general, the MDS 2.0-, OASIS-B-, and IRF-PAI-based analogues had low to moderate sensitivity when tested against CARE. Almost all of the MDS 2.0, OASIS-B, and IRF-PAI analogues had high specificity, but that result was perhaps due mainly to the low prevalence rate for the variables.

The observed differences in values between the CARE items and the analogues may be caused by the key differences in the design and instructions between the assessment instruments. These differences are discussed below.

- Time frame:
 - CARE: The assessment time frame is 2 calendar days (if the patient is admitted before 12 noon) or 3 calendar days (if the patient is admitted after 12 noon).
 - MDS 2.0: The time frame for completion is within 5 days (5-day prospective payment system assessment). The look-back period for the items assessed is either 7 calendar days or a 14-day look-back period that includes the assessment at the SNF facility or at a hospital as an outpatient or inpatient.
 - OASIS-B: The time frame for the majority of items refers to the patient's status for most of the day of the assessment visit, or the patient's usual status. A few of the OASIS-B items regarding prior service use and conditions require a 14-day look-back period immediately preceding the assessment.
 - IRF-PAI: The assessment time frame is 3 calendar days.
- Instructions for assessment:
 - CARE: Clinicians are instructed to report the usual (or typical) performance or status of the patients (similar to MDS).
 - MDS 2.0: Clinicians are instructed to report the usual status of the patients.
 - OASIS-B: Clinicians are instructed to report the patient's status for most of the day of the assessment visit, or the patient's usual status.
 - IRF-PAI: Clinicians are instructed to report the most dependent status.
- Alignment of scales for motor function score:
 - CARE: A higher score indicates a higher level of independence.
 - MDS 2.0: A higher score indicates a higher level of dependence.
 - OASIS-B: A higher score indicates a higher level of dependence.
 - IRF-PAI: A higher score indicates a higher level of independence.
- Data collection mode: Some analogous items in the MDS 2.0, OASIS-B, and IRF-PAI assessments require a different data collection mode from their CARE counterparts—for example, an interview instead of a staff member's observation.

- Measurement error: The frequency and magnitude of measurement errors may vary across the four assessment instruments.

Although we found differences between CARE items and their analogues in the MDS 2.0, OASIS-B, and IRF-PAI assessment instruments, RTI proceeded with the modeling work by replacing CARE items with these analogues. The predictive power of these strict replacement models was tested against the use of the CARE items in the models run on the PAC PRD sample.

3.4. Additional Assessment Items From Similar Domains

In addition to the strict item crosswalk models, we considered including additional items from the MDS 2.0, OASIS-B, and IRF-PAI outside of the item crosswalk to address the research question of whether the addition of other items could improve the ability of the risk adjustment models to predict PAC episode costs. The additional items outside of the item crosswalk were identified in domains similar to those that were included in the CARE and MDS 2.0, OASIS-B, and IRF-PAI crosswalk models. For example, four OASIS-B items were identified as analogous to the CARE variable for depression in the item crosswalk, all in M0590: 2—Sense of failure, 3—Hopelessness, 4—Recurrent thoughts of death, and 5—Thoughts of suicide. One item under the same domain—M0590 1, Depressed Mood—was not included in the item crosswalk because using this item to define depression can inflate the rate of depression. However, we included it as an additional assessment item to test whether including additional items can improve the prediction of the models. **Table 3-37** summarizes the additional OASIS-B items that were included in models to test whether the risk adjustment models could be improved. Similarly, **Tables 3-38** and **3-39** summarize the use of additional MDS 2.0 and IRF-PAI items, respectively. Note that some additional items were not included in the final regression models because of multicollinearity. These variables are marked with an asterisk in each table. If the correlation coefficient between an additional item from the same domain and another item in the model was greater than or equal to 0.7, the additional item was not included in the models. For example, the IRF-PAI item 39Q, Problem Solving, was considered an additional item in the same domain as 39R, Memory (which was the item analogous to the BIMS in the risk adjustment models using CARE variables). However, 39Q, Problem Solving, was not included in the final models because the correlation coefficient between this item and 39R, Memory, was 0.76; and the correlation coefficient between this item and 39O, Expression, (which was the item analogous to the expression item in the risk adjustment models using CARE variables) was 0.70.

Table 3-37. Additional OASIS-B Items

Domain	Item
Functional status—prior functioning	(M0640) Prior Grooming: Ability to tend to personal hygiene needs (i.e., washing face and hands, hair care, shaving or make up, teeth or denture care, fingernail care)
Functional status—bowel and bladder	(M0540) Bowel Incontinence Frequency 1—Less than once weekly 2—One to three times weekly 3—Four to six times weekly 4—On a daily basis 5—More often than once daily
Cognitive status	Behaviors demonstrated at least once a week: (M0610) Memory Deficit (M0610) Impaired Decision Making
Cognitive status—mood: possible depression present	(M0590) Depressive Feelings Reported or Observed in Patient
Medical status—severe pressure ulcers	(M0464) Status of Most Problematic Pressure Ulcer
Medical status— major wounds present	(M0440) Skin Lesion/Open Wound

NOTE: OASIS-B, Outcome Assessment Information Set.

Table 3-38. Additional MDS 2.0 Items

Domain	Item
Functional status—bowel and bladder	H1a. Bowel continence 0. Continent 1. Usually continent 2. Occasionally incontinent 3. Frequently incontinent 4. Incontinent H2. Bowel Elimination Pattern H2c. Diarrhea H2d. Fecal Impaction H3. Appliances and Programs H3a. Any Scheduled Toileting Plan H3g. Pads/briefs used

(continued)

Table 3-38. Additional MDS 2.0 Items (continued)

Domain	Item
Cognitive status	B2b. Long term memory B3. Memory recall ability* B3a. Current Season B3b. Location of Own Room B3c. Staff Names/Faces B3d. That He/She is in Nursing Home B5. Indicators of delirium B5a. Easily Distracted B5b. Altered Perception B5c. Disorganized Speech B5d. Restlessness B5e. Lethargy B5f. Varied Mental Function
Cognitive status—mood: possible depression present	E1. Indicators of depression, anxiety and sad mood E1a. Negative Statements E1b. Repetitive Questions E1c. Repetitive Verbalizations E1d. Persistent Anger E1e. Self Depreciation E1f. Unrealistic Fears E1g. States Something Terrible About to Happen E1h. Repetitive Health Complaints E1i. Repetitive Anxious Complaints E1j. Unpleasant Mood E1k. Insomnia E1n. Repetitive Physical Movements E1o. Withdrawal E1p. Reduced Social Interaction
Medical status—severe pressure ulcers	M2a. Pressure ulcer the highest state in the last 7 days = 2
Medical status—major wounds present	M4. Other skin problems or lesions present M4a. Abrasions/Bruises M4c. Open Lesions Other Than Ulcers/Rashes/Cuts M4d. Rashes M4e. Skin Desensitized to Pain/Pressure M4f. Skin Tears/Cuts M4g. Surgical Wounds M6. Foot problems and care M6c. Open Lesions on Foot
Medical status—swallowing symptoms	K1a. Chewing Problem

NOTES: MDS, Minimum Data Set. * The variable was not included in the regression models due to multicollinearity.

Table 3-39. Additional IRF-PAI Items

Domain	Item
Functional status—bowel and bladder	29. Bladder level of assistance 31. Bowel assistance at admission 32. Bowel frequency of accidents
Cognitive status	39. Q Problem Solving*
Cognitive status—mood: possible depression present	39. P Social Interaction*

NOTES: IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument. * The variable was not included in the regression models due to multicollinearity.

4. MODEL RESULTS

This chapter presents the results of the multivariate models predicting PAC episode payments and costs. These analyses were developed to address the following research questions:

1. How well do CARE variables predict PAC episode costs compared with PAC episode payments?
2. Can assessment items from the federally mandated assessment instruments collected in PAC settings be crosswalked to CARE items and substituted into models predicting PAC episode costs?
3. Can other items from federally mandated assessment instruments be included in episode risk adjustment models to improve prediction of PAC episode costs?
4. How do the results of models predicting PAC episode costs differ when the models are applied to a national sample rather than to the sample of beneficiaries from the PAC PRD?

Table 4-1 (the same as Table 2-14) summarizes the different models that were run to address the research questions. Five different models were run for each setting (SNF, HHA, and IRF) and episode definition (30-day variable length, 30-day fixed length, and 60-day fixed length) combination, for a total of 45 models. Each model varied in the sample (the PAC PRD sample or the national sample), the dependent variable (PAC episode payments or PAC episode costs), and the independent variables used (CARE variables; MDS 2.0, OASIS-B, or IRF-PAI crosswalk variables; or MDS 2.0, OASIS-B, or IRF-PAI crosswalk variables plus additional items from similar domains).

Table 4-1. Analysis Summary

Sample	Independent Variables: CARE	Independent Variables: Item Crosswalk (MDS 2.0, IRF-PAI, or OASIS-B)	Independent Variables: Item Crosswalk (MDS 2.0, IRF-PAI, or OASIS-B) + Additional Items
PAC PRD sample	<p>Research Question 1: Dependent variable = payments/episode Dependent variable = costs/episode</p>	<p>Research Question 2: Dependent variable = costs/episode</p>	<p>Research Question 3: Dependent variable = costs/episode</p>
2008 national sample	—	—	<p>Research Question 4: Dependent variable = costs/episode</p>

NOTE: CARE, Continuity Assessment Record and Evaluation; IRF-PAI, Inpatient Rehabilitation Facility-Patient Assessment Instrument; MDS, Minimum Data Set; OASIS-B, Outcome Assessment Information Set; PAC PRD, Post-Acute Care Payment Reform Demonstration.

The primary approach for evaluating the explanatory power of the models was to examine the model R^2 , which is a measure of the proportion of the variance in the dependent variable that can be explained by the independent variables included in the model.

Table 4-2 contains a summary of the model R^2 for the models run on beneficiaries with a first PAC setting of SNF, by episode definition (Models 1–15). Similar data are shown for beneficiaries with a first PAC setting of IRF (Models 16–30) in **Table 4-3** and for beneficiaries with a first PAC setting of HHA (Models 31–45) in **Table 4-4**. The full model results are shown for beneficiaries with a first PAC setting of SNF in **Tables 4-5a** through **4-5c**, for beneficiaries with a first PAC setting of IRF in **Tables 4-6a** through **4-6c**, and for beneficiaries with a first PAC setting of HHA in **Tables 4-7a** through **4-7c**. These model results show the variables that are significant in each model with a “+” or “–” to indicate the direction of the effect on the dependent variable. The “n/a” indicates the variables excluded from the different models, and the “ns” indicates the variables that were not significant. The results of the models are discussed below by major research question.

4.1 How well do CARE variables predict PAC episode costs compared with PAC episode payments?

The analysis indicates that across each first setting of PAC (SNF, IRF, and HHA), the models predicting PAC episode payments have slightly higher R^2 than the models predicting PAC episode costs. For example, for beneficiaries with a first PAC setting of SNF, the R^2 on the PAC episode payment model was 0.18 for the 30-day fixed-length episode definition and 0.13 in the cost model for the same episode definition. These values indicate that a higher proportion of variation in PAC episode payments can be explained by the model using the CARE variables as risk adjusters than by the model explaining PAC episode costs with the same set of independent variables.

For the same 30-day fixed-length episode definition, but for beneficiaries with a first PAC setting of IRF, the R^2 was 0.40 for the model predicting PAC episode payments and 0.36 for the model predicting PAC episode costs. Compared with beneficiaries with a first PAC setting of SNF, the models for beneficiaries with a first PAC setting of IRF had higher R^2 in general. One reason for this finding is that most PAC episode costs are generally attributable to the IRF setting; since the assessment data used in the models are from either the IRF stay or the acute discharge assessment that immediately preceded it, the ability to predict total PAC episode payments and costs is higher.

In contrast, the ability to predict PAC episode payments and costs for beneficiaries with a first PAC setting of HHA is much lower than in the institutional PAC settings. The R^2 on the model predicting PAC episode payments for the 30-day fixed-length episode for beneficiaries with a first PAC setting of HHA was 0.09, and the R^2 for the model predicting costs for the same episode definition was 0.06. Beneficiaries beginning their PAC episode in an HHA have greater variation in service use in their episodes that is difficult to capture in these

models. Similar results were found in earlier work on PAC episode risk adjustment (Morley et al., 2011).

Note that across all of the payment and cost models, the model R^2 increases for shorter episode definitions, reflecting the stronger ability to predict PAC episode payments and costs over shorter periods of time than over longer periods of time. This finding is also consistent with earlier work (Morley et al., 2011).

The results of this work indicate that PAC episode costs and PAC episode payments are highly correlated, and the ability of CARE variables to predict PAC episode payments and PAC episode costs is similar. This result is not unexpected. Although PAC costs do not reflect all of the characteristics of the payment systems, aspects of the payment systems remain embedded in costs. For example, to receive an IRF payment, IRFs must provide beneficiaries with 3 hours of therapy; the cost calculation will reflect these services.

4.2 Can assessment items from federally mandated assessment instruments collected in PAC settings be crosswalked to CARE items and substituted into models predicting PAC episode costs?

Overall, the results of the models using the item crosswalk for CARE to MDS 2.0, IRF-PAI, and OASIS-B indicate that the R^2 is slightly lower than for the models using the CARE variables. For example, for beneficiaries with a first PAC setting of SNF, the R^2 on the model predicting PAC episode costs using CARE variables was 0.13 for the 30-day fixed-length episode definition, but it decreased to 0.10 when the CARE variables were replaced with MDS 2.0 variables identified as analogous to the CARE variables. Similarly, for the same episode definition, for beneficiaries with a first PAC setting of IRF, the R^2 on the model predicting PAC episode costs using CARE variables was 0.36, but it decreased to 0.33 when the CARE variables were replaced with IRF-PAI variables identified as analogous to the CARE variables. Although the decrease in R^2 may be considered small, the findings do indicate that the CARE items may provide added information on beneficiary characteristics that can improve the ability to predict PAC episode costs.

4.3 Can other items from federally mandated assessment instruments be included in episode risk adjustment models to improve prediction of PAC episode costs?

After including additional items from the MDS 2.0, IRF-PAI, and OASIS-B outside those identified as analogous using the item crosswalk approach, we found that the model R^2 increased slightly in the SNF and HHA. For beneficiaries with an SNF as their first PAC setting, the R^2 on the model predicting PAC episode costs in the 30-day fixed-length episode definition using the MDS 2.0 variables identified as analogous to CARE variables was 0.10, but it increased to 0.13 when additional MDS 2.0 items from similar domains were included.

Similarly, in the HHA model, the R^2 on the model predicting PAC episode costs in the 30-day fixed-length episode definition using the OASIS variables identified as analogous to CARE variables was 0.08, but it increased to 0.09 when additional OASIS items from similar domains were included. In the SNF case, the R^2 on the models using MDS 2.0 variables plus additional variables from similar domains was still lower than the R^2 on the models predicting PAC episode costs using CARE variables. A similar pattern was observed across the different episode definitions. This finding indicates that the ability to predict PAC episode costs is slightly higher when using CARE than when using MDS 2.0, IRF-PAI, or OASIS-B.

4.4 How do the results of models predicting PAC episode costs differ when the models are applied to a national sample rather than to the sample of beneficiaries from the PAC PRD?

When the models were run on the national sample, we saw that the model R^2 values were slightly lower than when run on the PAC PRD sample. For example, for beneficiaries with a first PAC setting of SNF, the R^2 on the model predicting PAC episode costs for the 30-day fixed-length episode was 0.10 when run on the national sample and 0.13 when run on the PAC PRD sample. Similarly, among beneficiaries with a first PAC setting of IRF, the R^2 on the model predicting PAC episode costs for the 30-day fixed-length episode was 0.30 when run on the national sample and 0.33 when run on the PAC PRD sample. Of note is that the number of variables found to be significant in the national sample models was higher than in the PAC PRD models because of the much larger number of observations in the national sample analysis. Although the R^2 was slightly lower when run on the national sample than on the PAC PRD sample across episode definitions and first sites of PAC, the results do indicate that the models can work with a similar degree of prediction across samples. The results of this analysis indicate that, although the data collected in the PAC PRD were relatively limited and not representative of all areas of the country, when the PAC episode risk adjustment approach is extrapolated to the national population, we find similar results overall.

4.5 Predicted PAC Episode Costs Across Models

Another approach that we used to evaluate the models was to plot the predicted values for PAC episode payment from the models using MDS 2.0, IRF-PAI, and OASIS-B against the predicted PAC episode costs using CARE. Plots for the 30-day fixed-length episode are presented in **Figure 4-1** for beneficiaries with a first PAC setting of SNF, in **Figure 4-2** for beneficiaries with a first PAC setting of IRF, and in **Figure 4-3** for beneficiaries with a first PAC setting of HHA. If each of the models predicted the same value, we would expect the dots on the plots to fall on the 45-degree line. Instead, we see that in some cases the CARE model predicts higher PAC episode costs than the MDS 2.0, IRF-PAI, or OASIS-B models (dots below the 45-degree line); in other cases the MDS 2.0, IRF-PAI, or OASIS-B models

predict higher PAC episode costs than the CARE model (dots above the 45-degree line). This analysis suggests that there do not appear to be any systematic differences in the direction of prediction using CARE, MDS 2.0, IRF-PAI, or OASIS-B. In looking across the three figures, it is clear that there is a tighter fit between predicted values for beneficiaries with IRF as their first PAC setting. This is expected given that most PAC episode costs for beneficiaries with an IRF as their first PAC setting will be for the IRF stay. In contrast, there is greater variation in PAC episode costs for beneficiaries with an HHA as their first PAC setting. For example, acute hospital readmissions for beneficiaries with a first PAC setting of HHA contribute to greater variation in PAC episode costs and make it more difficult to predict PAC episode costs for beneficiaries with variable service utilization after their HHA episodes. Similar scatter plots were also generated for the other episode definitions and revealed similar patterns in the results (data not shown).

In addition to the scatter plots of predicted values, we also created scatter plots to examine differences in the error for models predicting PAC episode costs using CARE compared with models using MDS 2.0, IRF-PAI, and OASIS-B. To do this, we plotted the ratio of the predicted PAC episode cost to the actual PAC episode cost for models using MDS 2.0, IRF-PAI, and OASIS-B against the ratio of the predicted PAC episode costs to the actual PAC episode cost for the models using CARE. These plots were generated by quartile of predicted PAC episode costs on CARE to examine any differences in prediction error for high or low predicted PAC episode costs. The results of these plots for the 30-day fixed-length episode definition are shown in **Figures 4-4a** through **4-4d** for beneficiaries with a first PAC setting of SNF, in **Figures 4-5a** through **4-5d** for beneficiaries with a first PAC setting of IRF, and **Figures 4-6a** through **4-6d** for beneficiaries with a first PAC setting of HHA. These figures indicate that the large majority of the dots are clustered around the origin, with a few outliers indicating very different predicted-to-actual ratios on CARE compared with the MDS 2.0, IRF-PAI, or OASIS-B. Overall the results indicate that there are not significant differences in the error of the models for higher than for lower PAC episode costs. Similar results were also found in examining the other episode definitions (data not shown).

Table 4-2. Model R² Summary by Episode Definition, First PAC Setting = SNF

Model Characteristic	R ²	R ²	R ²	R ²	R ²
Sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	National sample
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Variables	CARE variables	CARE variables	MDS 2.0 variables from crosswalk	MDS 2.0 variables from crosswalk + additional items	MDS 2.0 variables from crosswalk + additional items
30-day variable-length episode (Models 1–5)	0.14	0.12	0.09	0.12	0.08
30-day fixed-length episode (Models 6–10)	0.18	0.13	0.10	0.13	0.10
60-day fixed-length episode (Models 11–15)	0.17	0.12	0.09	0.12	0.10

NOTE: CARE, Continuity Record Assessment and Evaluation; MDS, Minimum Data Set; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

Table 4-3. Model R² Summary by Episode Definition, First PAC Setting = IRF

Model Characteristic	R ²	R ²	R ²	R ²	R ²
Sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	National sample
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Variables	CARE variables	CARE variables	IRF-PAI variables from crosswalk	IRF-PAI variables from crosswalk + additional items	IRF-PAI variables from crosswalk + additional items
30-day variable-length episode (Models 16–20)	0.26	0.24	0.22	0.22	0.20
30-day fixed-length episode (Models 21–25)	0.40	0.36	0.33	0.33	0.30
60-day fixed-length episode (Models 26–30)	0.36	0.32	0.30	0.30	0.27

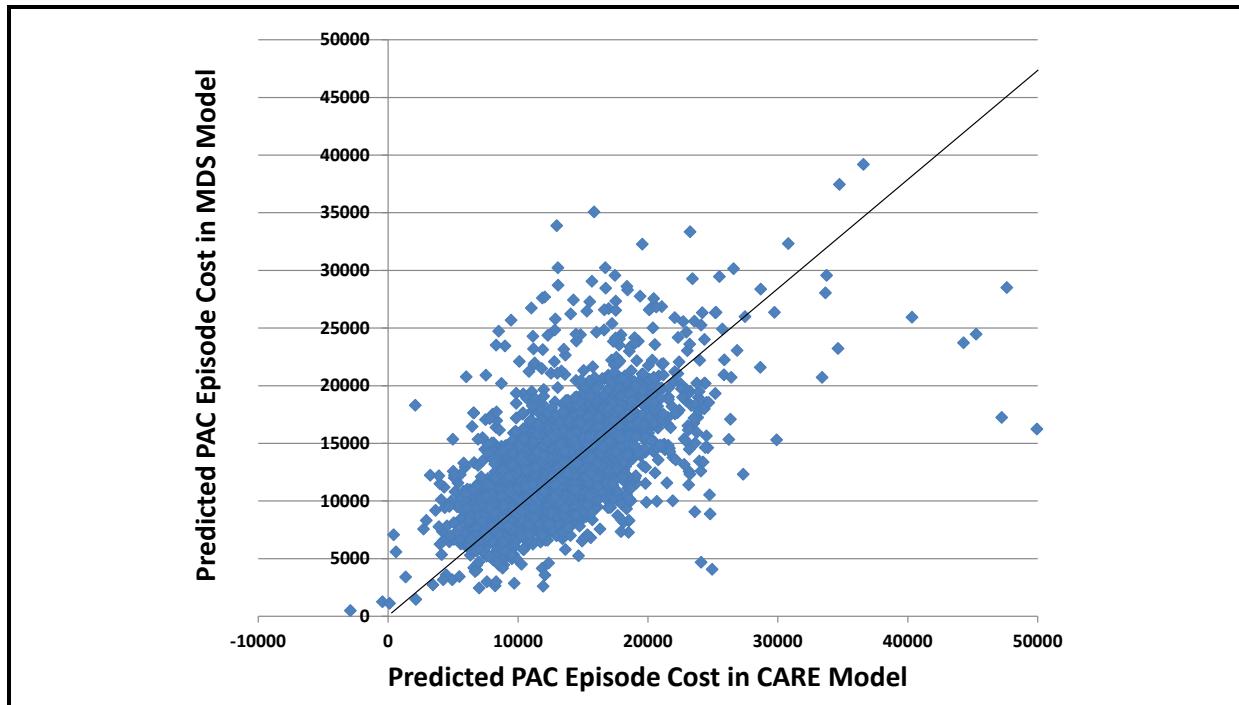
NOTE: CARE, Continuity Record Assessment and Evaluation; IRF, inpatient rehabilitation facility; MDS, Minimum Data Set; PAC, post-acute care; PRD, Payment Reform Demonstration.

Table 4-4. Model R² Summary by Episode Definition, First PAC Setting = HHA

Model Characteristic	R ²	R ²	R ²	R ²	R ²
Sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	PAC PRD sample	National sample
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Variables	CARE variables	CARE variables	OASIS-B variables from crosswalk	OASIS-B variables from crosswalk + additional items	OASIS-B variables from crosswalk + additional items
30-day variable-length episode (Models 31–35)	0.10	0.09	0.08	0.09	0.06
30-day fixed-length episode (Models 36–40)	0.09	0.06	0.05	0.06	0.04
60-day fixed-length episode (Models 41–45)	0.09	0.06	0.06	0.06	0.04

NOTE: CARE, Continuity Record Assessment and Evaluation; HHA, home health agency; MDS, Minimum Data Set; PAC, post-acute care; PRD, Payment Reform Demonstration.

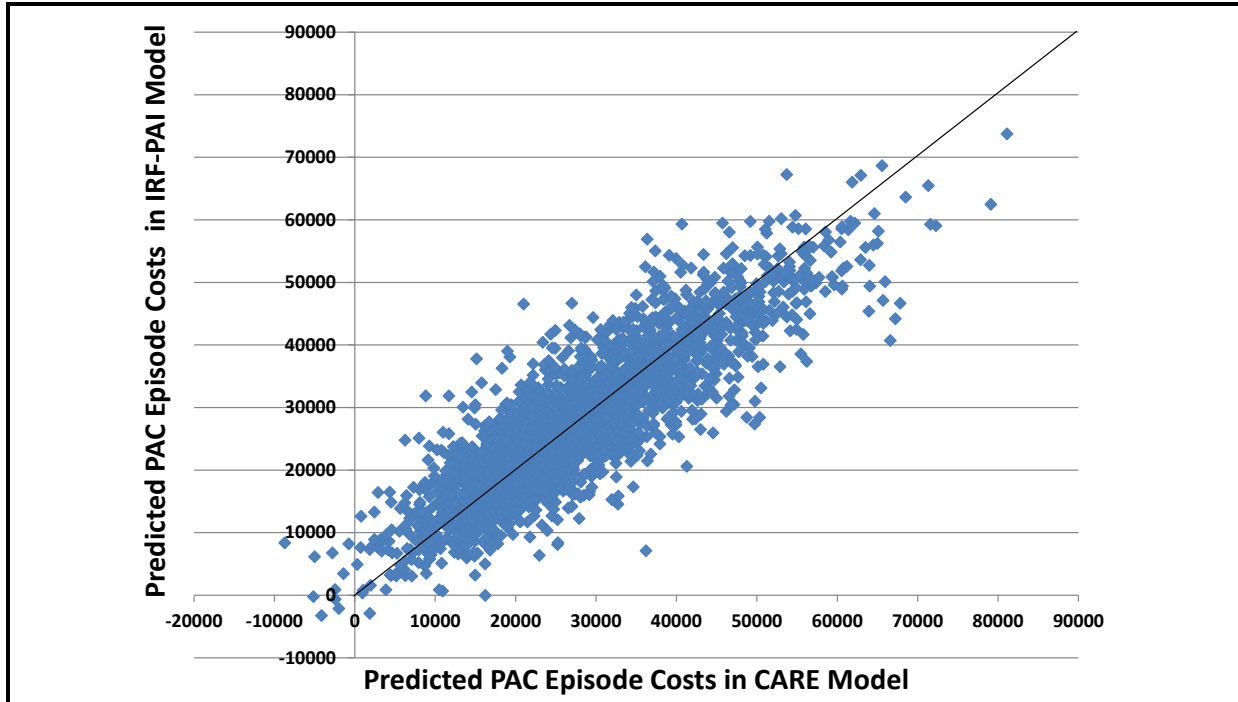
Figure 4-1. Predicted PAC Episode Cost in MDS 2.0 Model Compared With CARE Model, Episodes Where First PAC = SNF, 30-Day Fixed-Length Episode



NOTE: Correlation coefficient = 0.63.

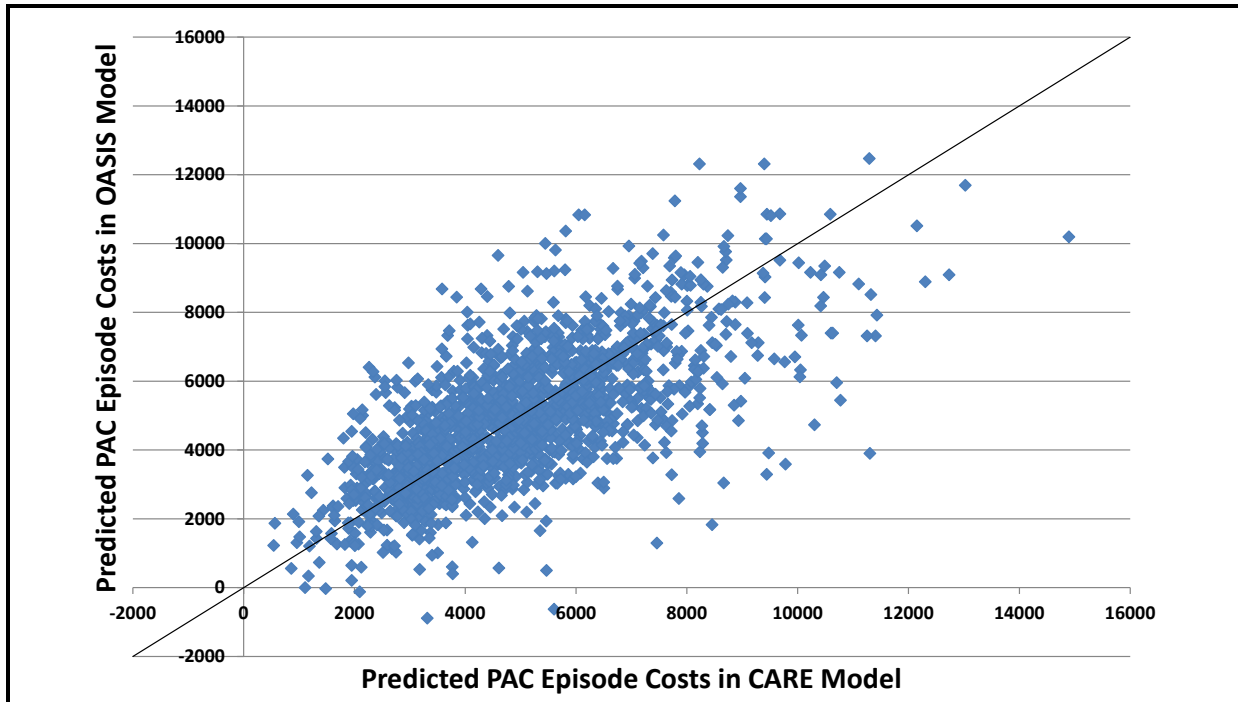
SOURCE: ASPERISK2_236.

Figure 4-2. Predicted PAC Episode Costs in IRF-PAI Model Compared With CARE Model, Episodes Where First PAC = IRF, 30-Day Fixed-Length Episode



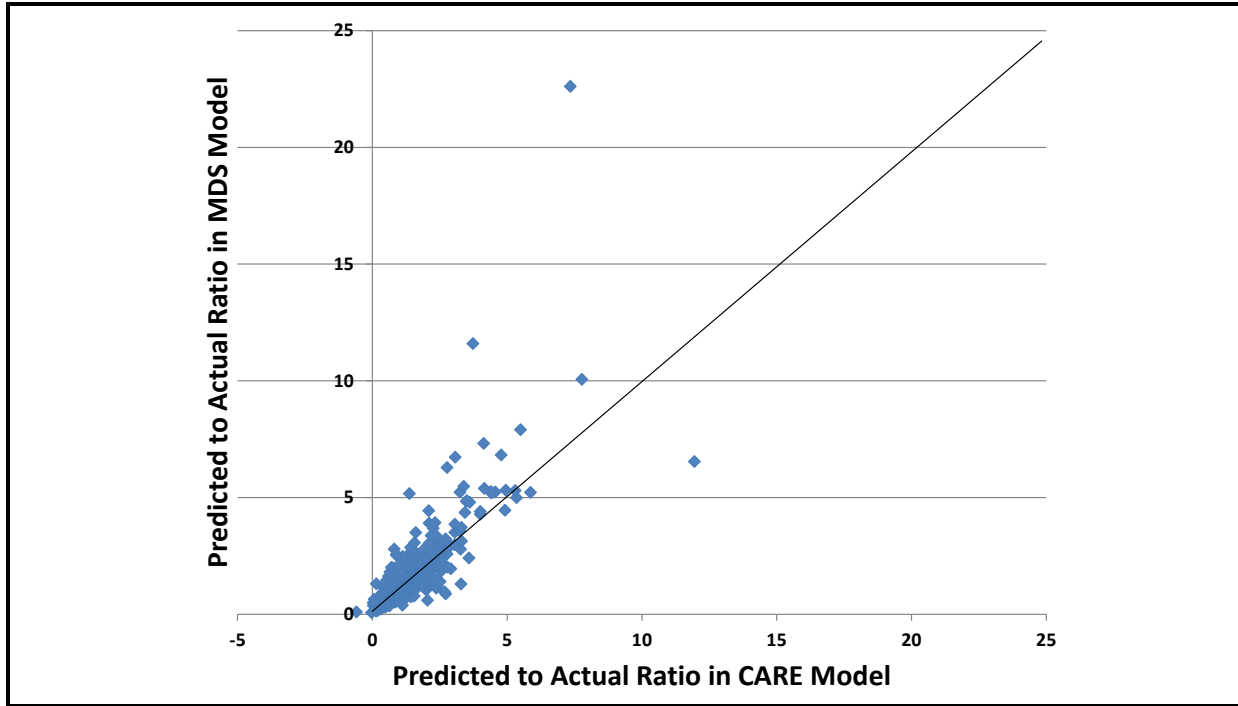
NOTE: Correlation coefficient = 0.87.
SOURCE: ASPERISK2_236.

Figure 4-3. Predicted PAC Episode Costs in OASIS-B Model Compared With CARE Model, Episodes Where First PAC = HHA, 30-Day Fixed-Length Episode



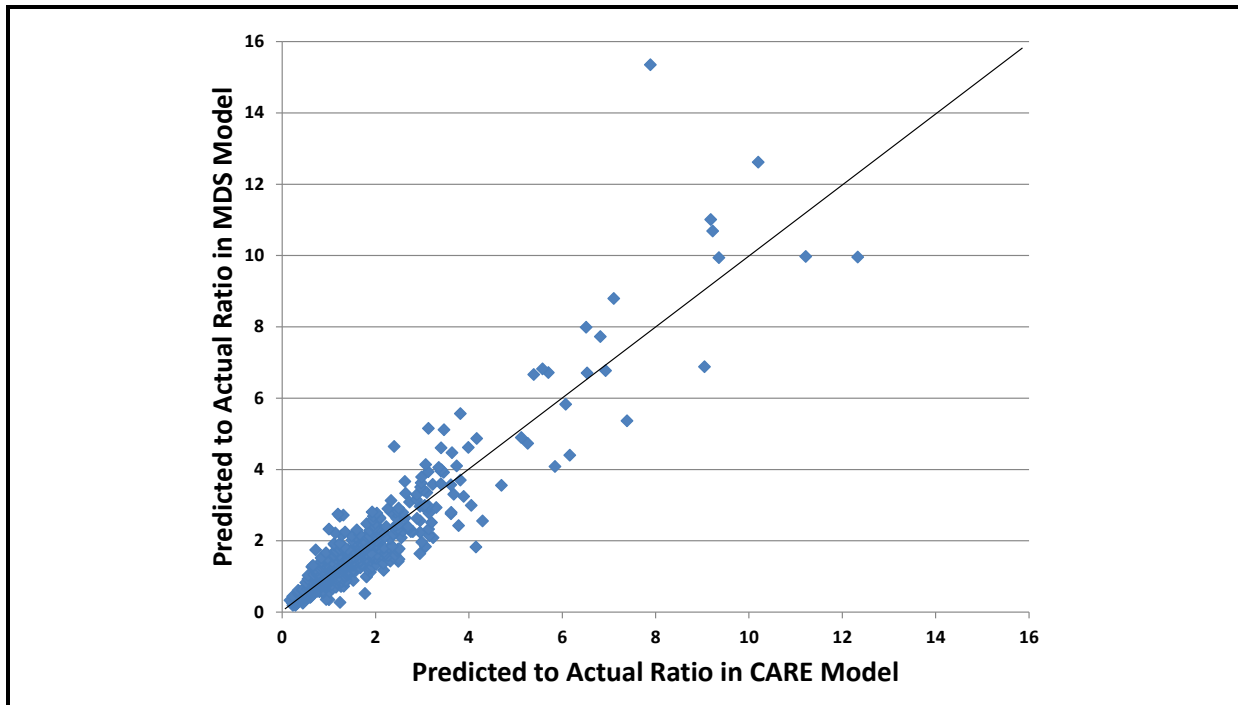
NOTE: Correlation coefficient = 0.69.
SOURCE: ASPERISK2_236.

Figure 4-4a. Predicted-to-Actual Ratio in MDS 2.0 Model and in CARE Model, Episodes Where First PAC = SNF, 30-Day Fixed-Length Episode—Quarter 1 of Predicted Values in CARE Model



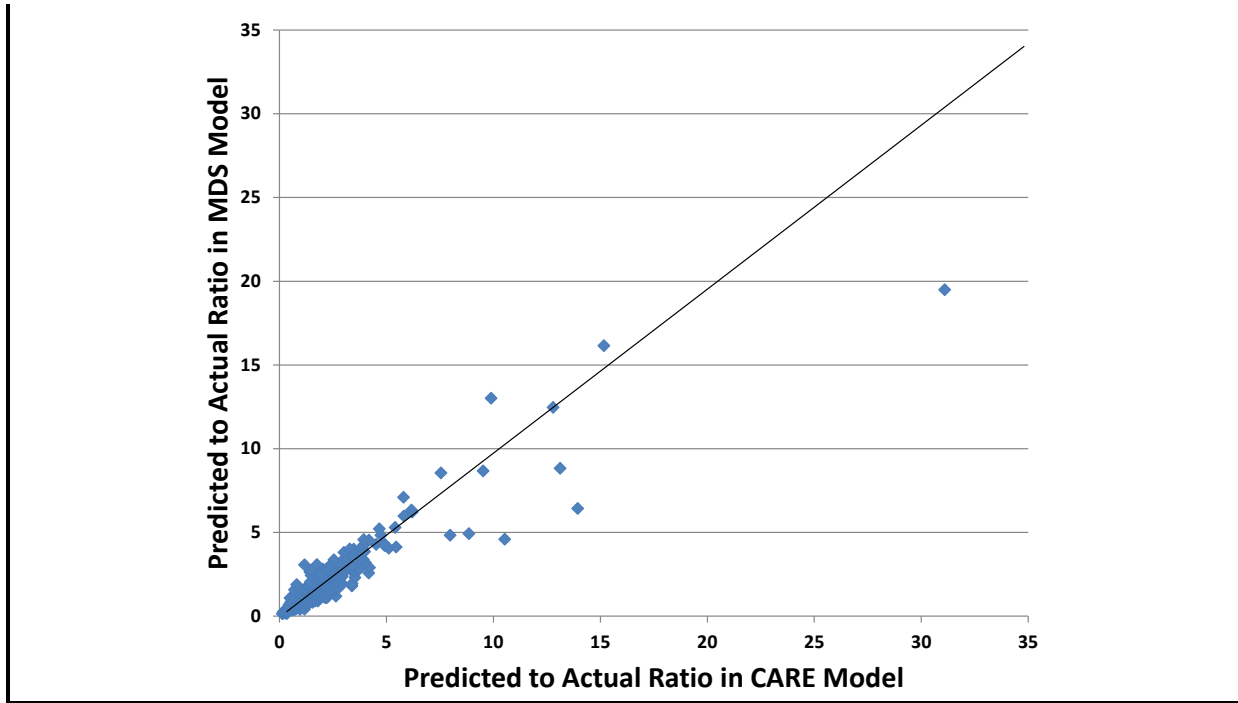
SOURCE: ASPERISK2_236.

Figure 4-4b. Predicted-to-Actual Ratio in MDS 2.0 Model and in CARE Model, Episodes Where First PAC = SNF, 30-Day Fixed-Length Episode—Quarter 2 of Predicted Values in CARE Model



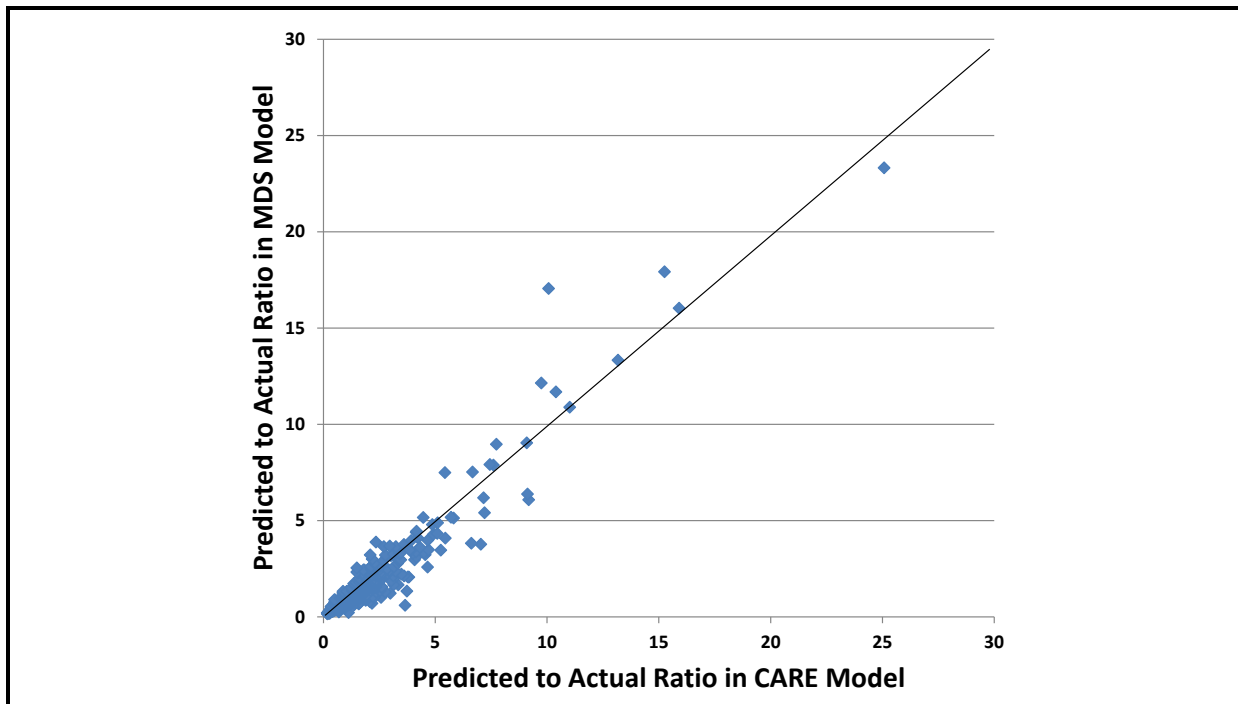
SOURCE: ASPERISK2_236.

Figure 4-4c. Predicted-to-Actual Ratio in MDS 2.0 Model and in CARE Model, Episodes Where First PAC = SNF, 30-Day Fixed-Length Episode—Quarter 3 of Predicted Values in CARE Model



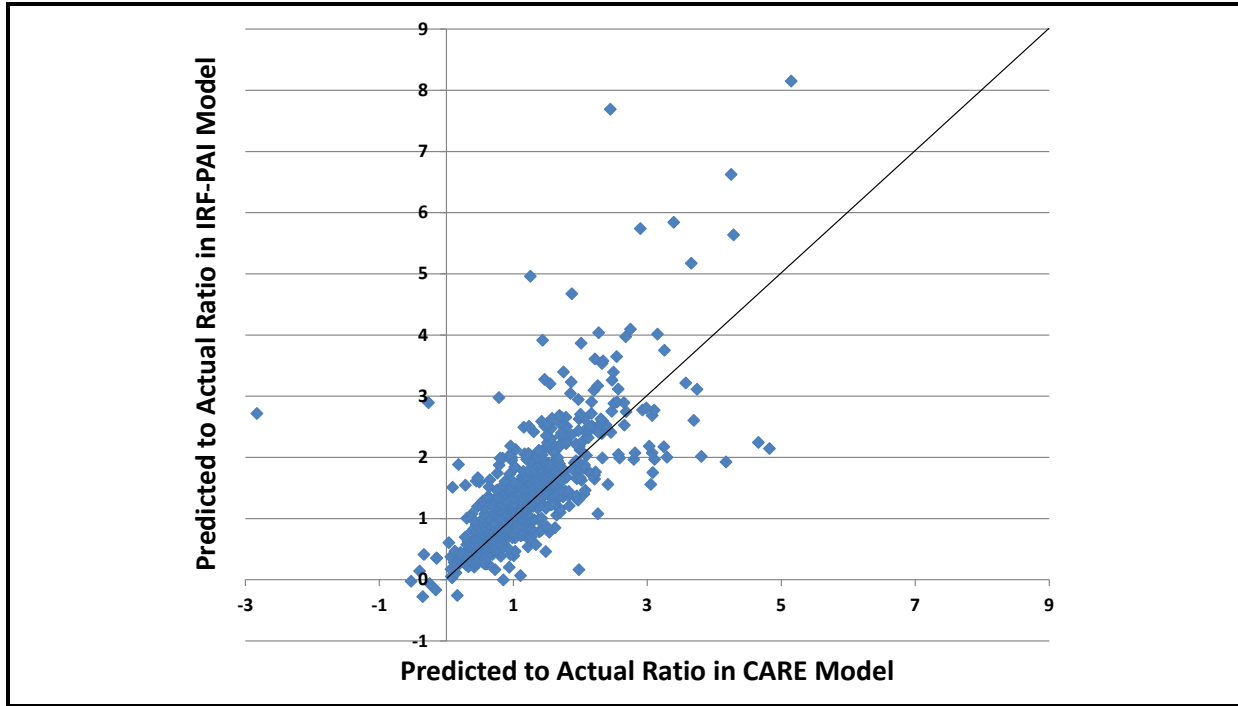
SOURCE: ASPERISK2_236.

Figure 4-4d. Predicted-to-Actual Ratio in MDS 2.0 Model and in CARE Model, Episodes Where First PAC = SNF, 30-Day Fixed-Length Episode—Quarter 4 of Predicted Values in CARE Model



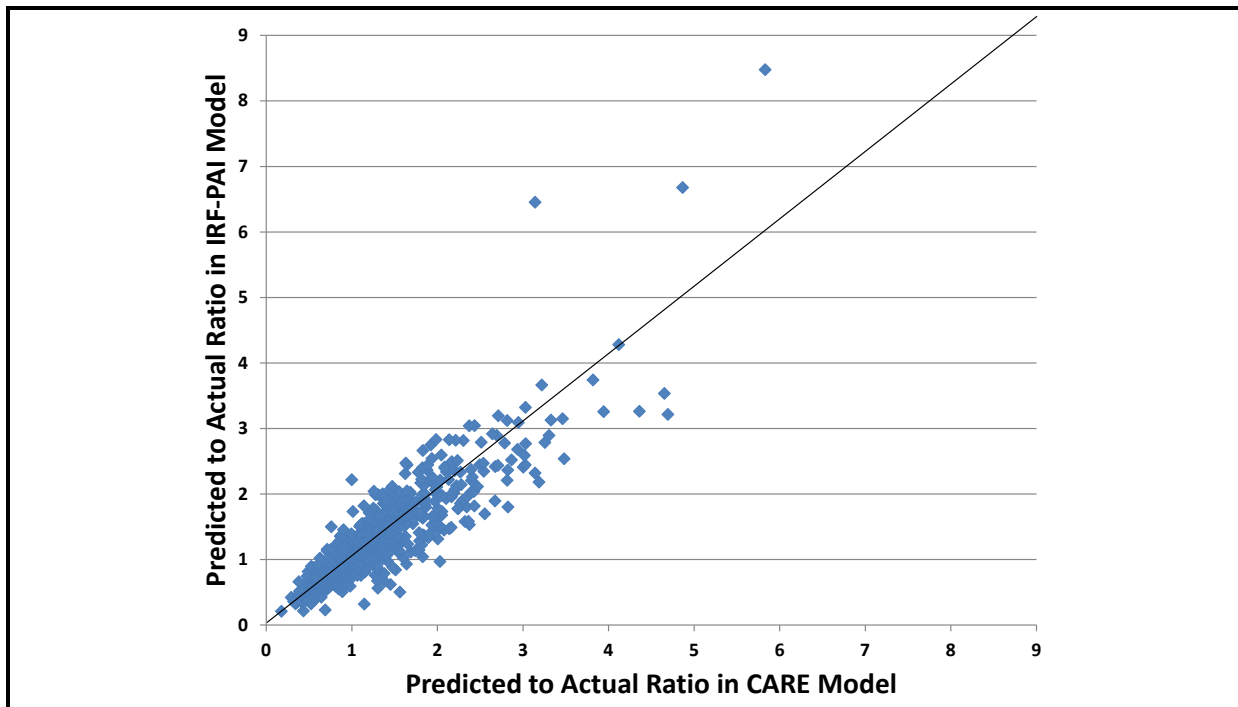
SOURCE: ASPERISK2_236.

Figure 4-5a. Predicted-to-Actual Ratio in IRF-PAI Model and in CARE Model, Episodes Where First PAC = IRF, 30-Day Fixed-Length Episode—Quarter 1 of Predicted Values in CARE Model



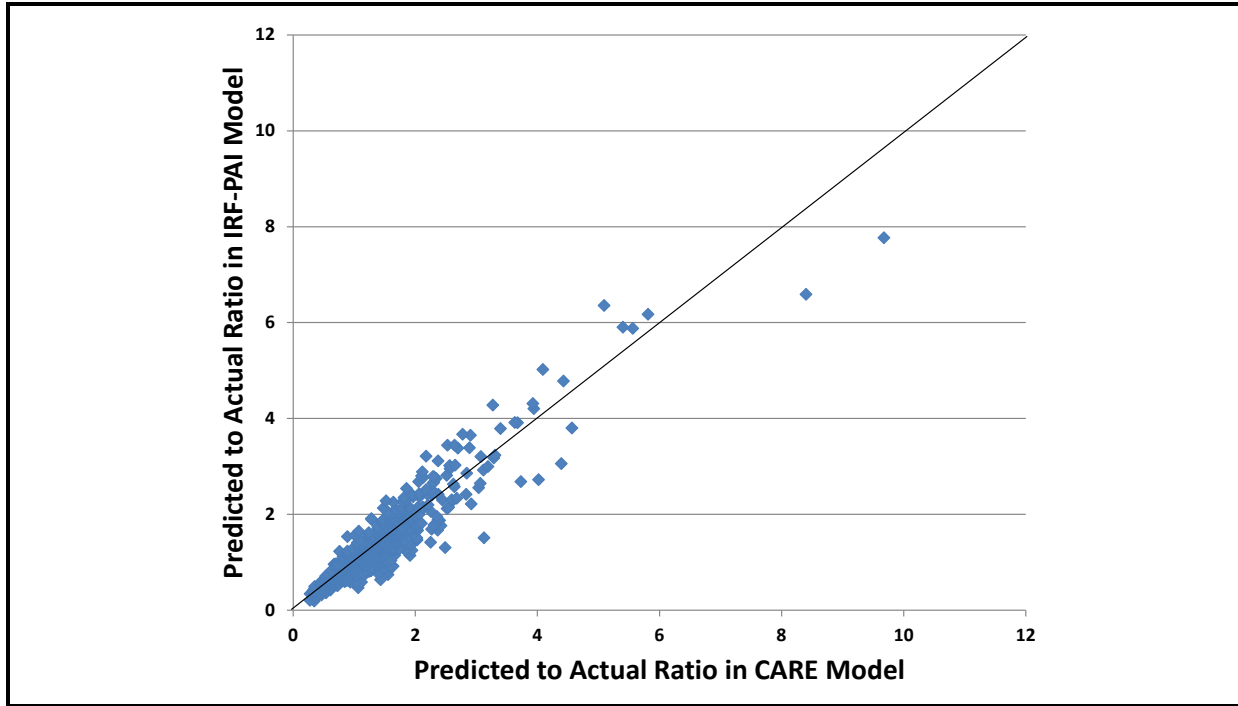
SOURCE: ASPERISK2_236.

Figure 4-5b. Predicted-to-Actual Ratio in IRF-PAI Model and in CARE Model, Episodes Where First PAC = IRF, 30-Day Fixed-Length Episode—Quarter 2 of Predicted Values in CARE Model



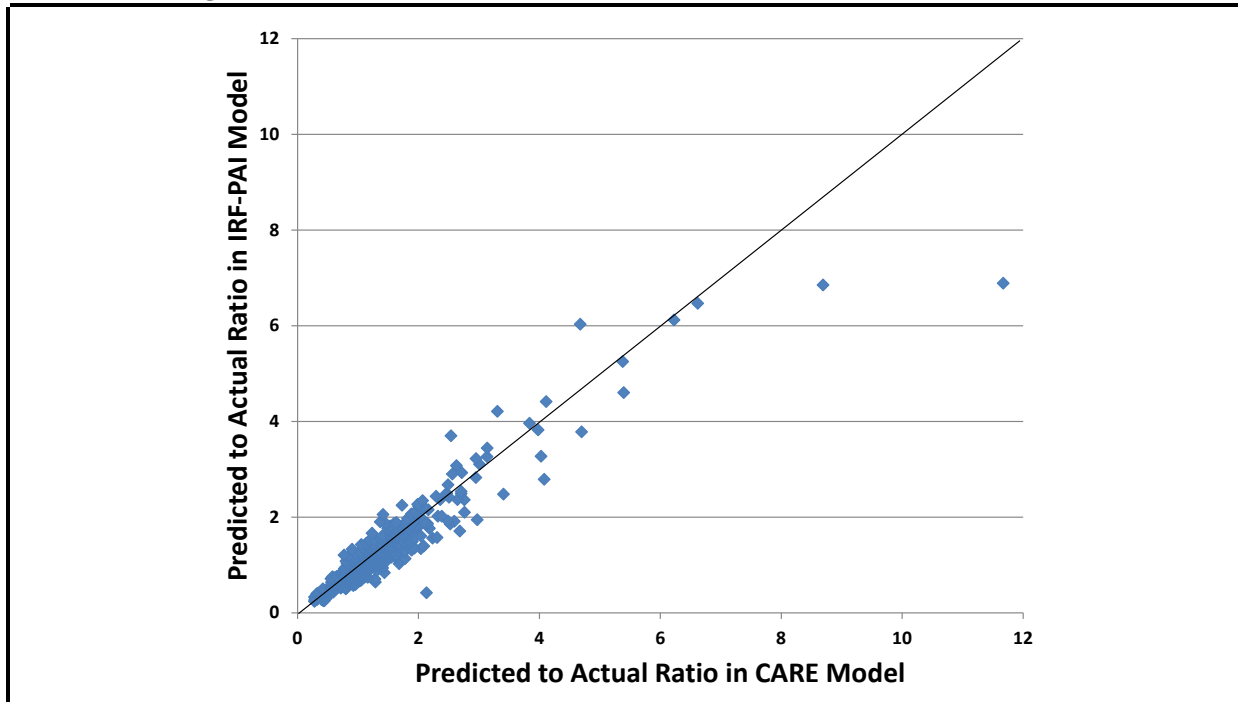
SOURCE: ASPERISK2_236.

Figure 4-5c. Predicted-to-Actual Ratio in IRF-PAI Model and in CARE Model, Episodes Where First PAC = IRF, 30-Day Fixed-Length Episode—Quarter 3 of Predicted Values in CARE Model



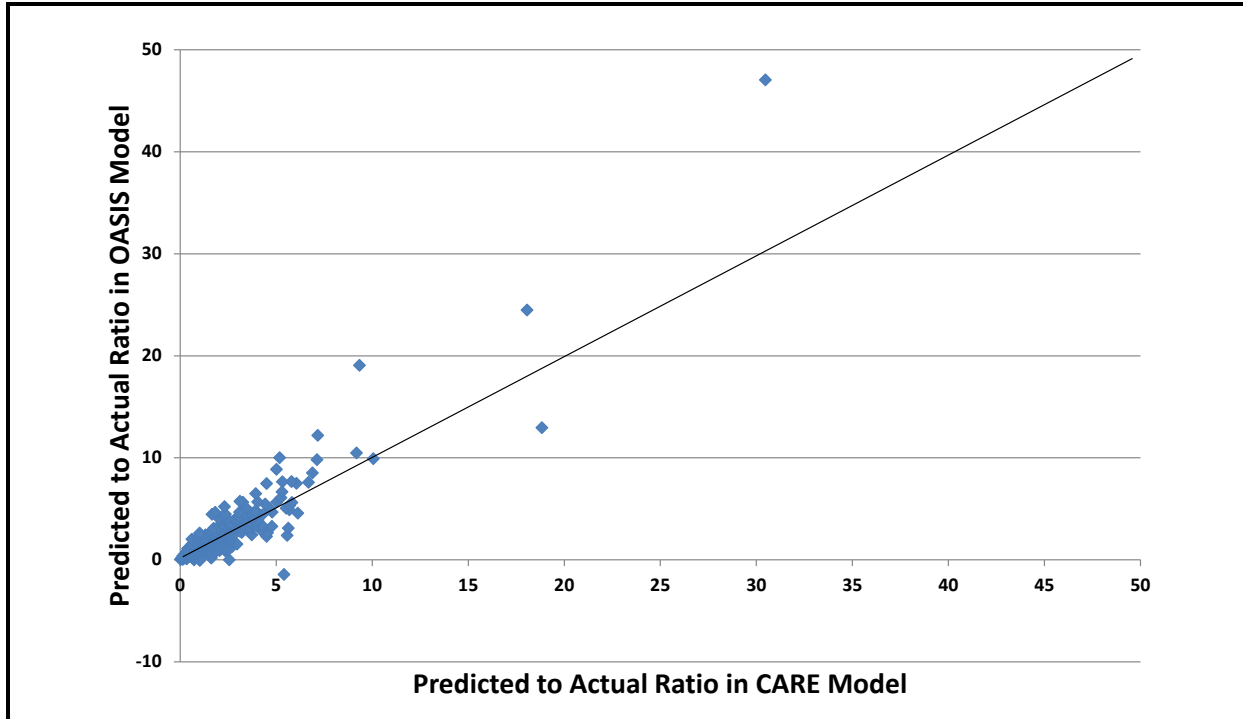
SOURCE: ASPERISK2_236.

Figure 4-5d. Predicted-to-Actual Ratio in IRF-PAI Model and in CARE Model, Episodes Where First PAC = IRF, 30-Day Fixed-Length Episode—Quarter 4 of Predicted Values in CARE Model



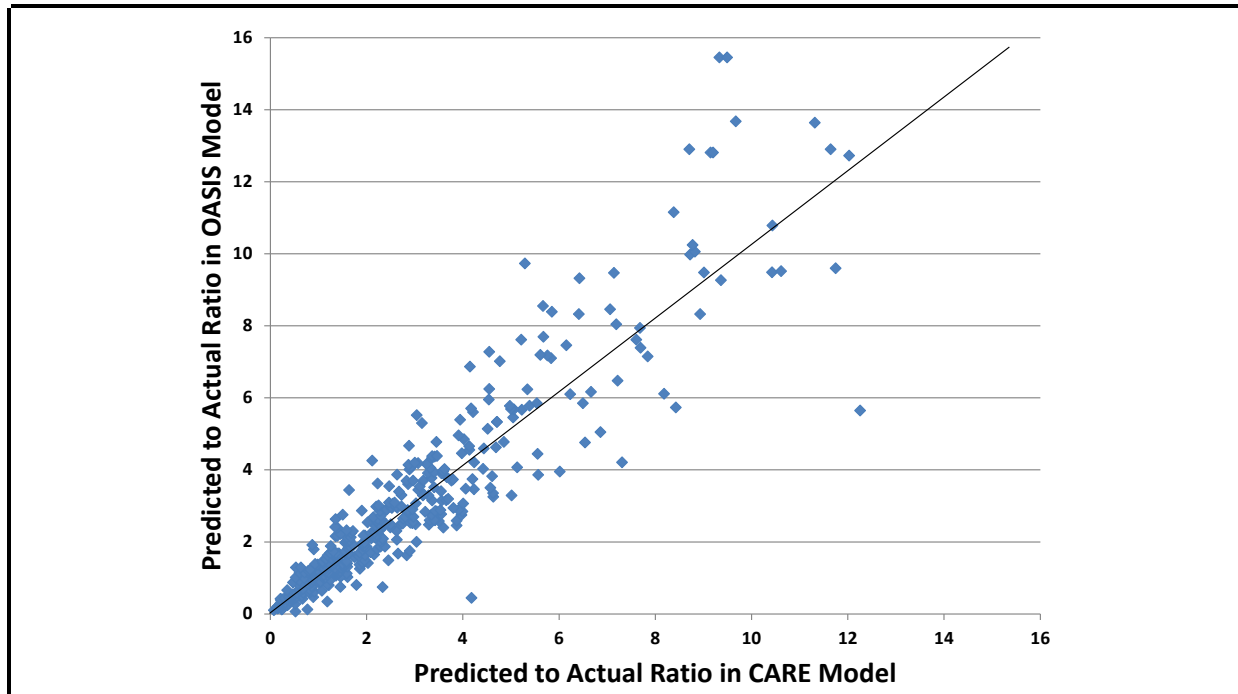
SOURCE: ASPERISK2_236.

Figure 4-6a. Predicted-to-Actual Ratio in OASIS-B Model and in CARE Model, Episodes Where First PAC = HHA, 30-Day Fixed-Length Episode—Quarter 1 of Predicted Values in CARE Model



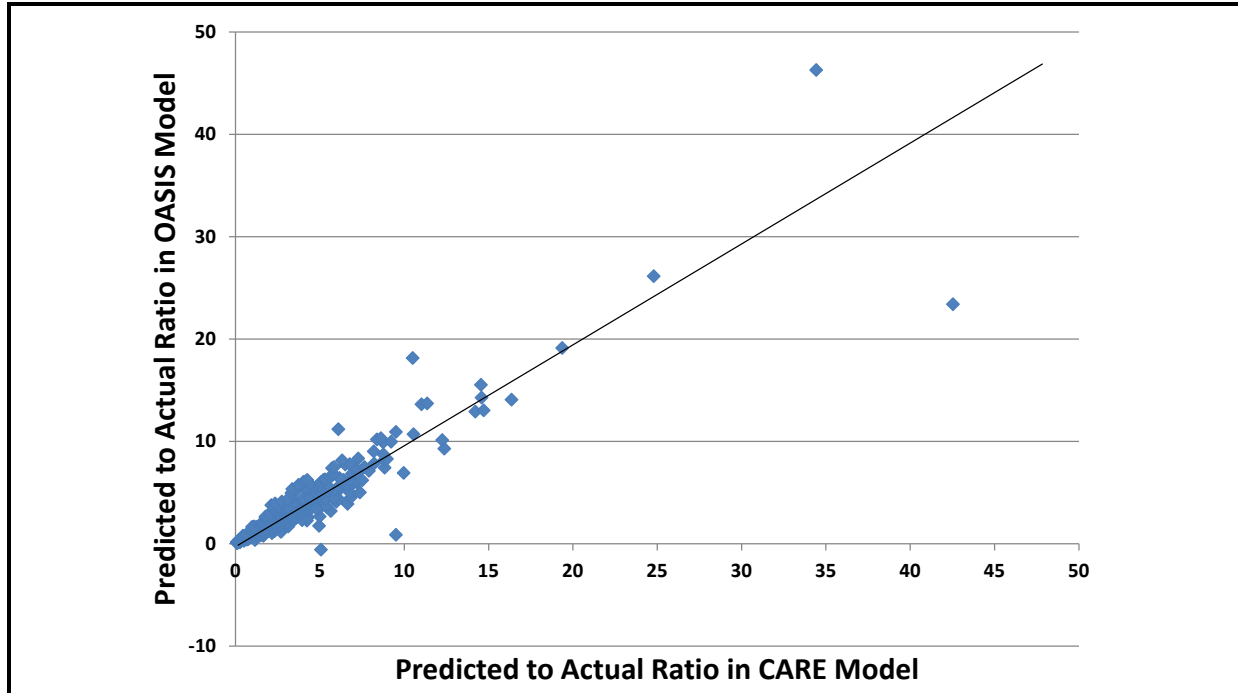
SOURCE: ASPERISK2_236.

Figure 4-6b. Predicted-to-Actual Ratio in OASIS-B Model and in CARE Model, Episodes Where First PAC = HHA, 30-Day Fixed-Length Episode—Quarter 2 of Predicted Values in CARE Model



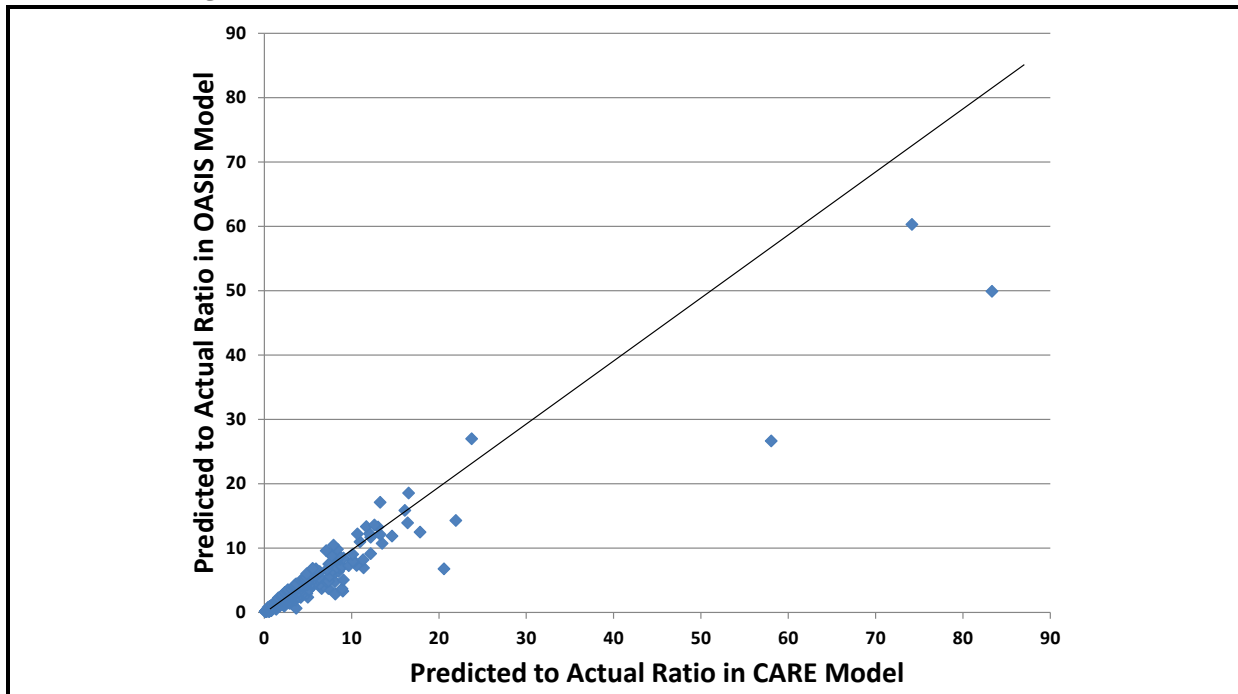
SOURCE: ASPERISK2_236.

Figure 4-6c. Predicted-to-Actual Ratio in OASIS-B Model and in CARE Model, Episodes Where First PAC = HHA, 30-Day Fixed-Length Episode—Quarter 3 of Predicted Values in CARE Model



SOURCE: ASPERISK2_236.

Figure 4-6d. Predicted-to-Actual Ratio in OASIS-B Model and in CARE Model, Episodes Where First PAC = HHA, 30-Day Fixed-Length Episode—Quarter 4 of Predicted Values in CARE Model



SOURCE: ASPERISK2_236.

Table 4-5a. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Variable-Length Episode

Model Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5
Episode length	30-Day variable	30-Day variable	30-Day variable	30-Day variable	30-Day variable
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	MDS 2.0 variables from crosswalk	MDS 2.0 variables from crosswalk+ additional items	MDS 2.0 variables from crosswalk+ additional items
Intercept	+	ns	ns	ns	+
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	ns	ns	ns	ns	+
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	ns	ns	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	ns	+
Respiratory	ns	ns	ns	ns	ns
Cardiovascular	ns	+	ns	ns	+
Integumentary	ns	ns	ns	ns	+
Endocrine	—	ns	ns	—	+
Kidney and urinary	ns	ns	ns	ns	+
Infections	ns	ns	ns	ns	
Transplant	+	ns	ns	+	+
Gastrointestinal & hepatobiliary	ns	ns	ns	ns	
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	ns
Intensive care unit (ICU)					
ICU days	ns	ns	ns	ns	+
ICU days squared	ns	ns	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	ns	ns	ns	+

(continued)

Table 4-5a. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	ns	ns	ns	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	ns
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	ns
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	ns	ns	ns	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	ns	ns	ns	+
Acute and chronic renal (HCC135,136,137,138)	ns	ns	ns	ns	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	+	+	+	+	+
Major treatments					
Hemodialysis	+	+	+	ns	+
Total parenteral nutrition	ns	ns	ns	ns	ns
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	ns	ns	+
Turning surfaces—at least one not intact					
Yes	+	ns	n/a	n/a	n/a
Major wounds present	+	+	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	ns	ns	ns	ns	—
Moderately impaired	ns	ns	ns	ns	+
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-5a. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	—	—	ns	ns	—
Frequent difficulty	—	ns	—	—	—
Some difficulty	—	ns	ns	ns	—
Missing	—	ns	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	—	—	n/a	n/a	n/a
History of falls	+	+	+	+	+
Bowel: indwelling or external device used					
Yes	ns	ns	ns	ns	+
Bladder incontinence					
Yes	ns	ns	ns	ns	+
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	ns	ns	—
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory Status—Impaired	ns	ns	ns	ns	+
Ventilator (weaning or nonweaning)	ns	+	ns	ns	ns
Sitting endurance [ref yes, can do without support]					
No, could not do	ns	ns	n/a	n/a	n/a
Yes, can do with support	+	+	n/a	n/a	n/a
Not assessed due to medical restriction	ns	ns	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	ns	ns	+
No interview, comatose, or missing	ns	ns	n/a	n/a	n/a
Motor measure at admission	—	—	+	+	+
High LTCH or IRF market	ns	ns	ns	ns	—

(continued)

Table 4-5a. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5
Prior acute hospitalizations in the last 12 months					
One	ns	ns	—	ns	+
Two or more	+	ns	—	ns	+
Hospital wage index	n/a	+	+	+	+
Additional Minimum Data Set 2.0 items					
Pressure ulcer highest state in last 7 days = 2	n/a	n/a	n/a	ns	+
Skin desensitized to pain or pressure	n/a	n/a	n/a	+	ns
Surgical wounds	n/a	n/a	n/a	—	—
Foot lesions	n/a	n/a	n/a	+	+
Abrasions	n/a	n/a	n/a	ns	—
Lesions	n/a	n/a	n/a	ns	+
Rashes	n/a	n/a	n/a	ns	+
Cuts	n/a	n/a	n/a	ns	ns
Toileting plan	n/a	n/a	n/a	+	—
Incontinence pad	n/a	n/a	n/a	ns	+
Bowel incontinence	n/a	n/a	n/a	ns	—
Diarrhea	n/a	n/a	n/a	ns	+
Fecal impaction	n/a	n/a	n/a	+	ns
Delirium	n/a	n/a	n/a	—	—
Long-term memory	n/a	n/a	n/a	ns	—
Indicators of depression, anxiety, and sad mood	n/a	n/a	n/a	ns	—
Chewing problems	n/a	n/a	n/a	ns	—
n	2,694	2,619	2,490	2,490	245,124
R ²	0.14	0.12	0.09	0.12	0.08
R ² for model ending in readmission	0.17	0.15	0.14	0.17	0.10

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; MDS, Minimum Data Set; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "—" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_291, ASPERISK2_292, ASPERISK2_150.

Table 4-5b. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Fixed-Length Episode

Model Characteristic	Model 6	Model 7	Model 8	Model 9	Model 10
Episode length	30-day fixed	30-day fixed	30-day fixed	30-day fixed	30-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	MDS 2.0 variables from crosswalk	MDS 2.0 variables from crosswalk+ additional items	MDS 2.0 variables from crosswalk + additional items
Intercept	+	+	ns	ns	ns
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	—	ns	ns	ns	—
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	ns	ns	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	ns	+
Respiratory	ns	ns	ns	ns	—
Cardiovascular	ns	ns	ns	ns	—
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	ns
Kidney and urinary	ns	ns	ns	ns	—
Infections	ns	+	ns	ns	—
Transplant	+	+	+	+	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	—
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	+
Intensive care unit (ICU)					
ICU days	+	ns	ns	ns	+
ICU days squared	+	ns	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	+	ns	ns	+

(continued)

Table 4-5b. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 6	Model 7	Model 8	Model 9	Model 10
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	ns	ns	ns	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	+
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	ns
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	ns	ns	+	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	ns	ns	+	+
Acute and chronic renal (HCC135,136,137,138)	+	+	+	+	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	+	+	+	+	+
Major treatments					
Hemodialysis	ns	ns	ns	ns	+
Total parenteral nutrition	ns	+	ns	ns	+
Central line management	ns	+	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	+	+	+
Turning surfaces—at least one not intact					
Yes	ns	ns	n/a	n/a	n/a
Major wounds present	+	+	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	+	ns	ns	ns	+
Moderately impaired	+	ns	ns	ns	+
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-5b. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 6	Model 7	Model 8	Model 9	Model 10
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	—	ns	—	—	—
Frequent difficulty	—	ns	ns	ns	—
Some difficulty	ns	ns	ns	ns	—
Missing	—	—	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	—	—	n/a	n/a	n/a
History of falls	+	+	+	+	+
Bowel: indwelling or external device used					
Yes	—	ns	ns	ns	+
Bladder incontinence					
Yes	ns	ns	ns	ns	+
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	ns	ns	
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory Status—Impaired	+	+	+	+	+
Ventilator (weaning or nonweaning)	+	ns	ns	ns	ns
Sitting endurance [ref yes, can do without support]					
No, could not do	ns	ns	n/a	n/a	n/a
Yes, can do with support	ns	+	n/a	n/a	n/a
Not assessed due to medical restriction	ns	+	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	ns	ns	+
No interview, comatose, or missing	ns	—	n/a	n/a	n/a
Motor measure at admission	—	—	+	+	+
High LTCH or IRF market	ns	ns	ns	ns	—
Prior acute hospitalizations in the last 12 months					
One	ns	ns	ns	ns	+
Two or more	ns	—	ns	ns	+
Hospital wage index	n/a	+	+	+	+

(continued)

Table 4-5b. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 6	Model 7	Model 8	Model 9	Model 10
Additional MDS 2.0 Items					
Pressure ulcer highest state in last 7 days = 2	n/a	n/a	n/a	ns	+
Skin desensitized to pain or pressure	n/a	n/a	n/a	ns	—
Surgical wounds	n/a	n/a	n/a	ns	—
Foot lesions	n/a	n/a	n/a	+	+
Abrasions	n/a	n/a	n/a	—	—
Lesions	n/a	n/a	n/a	ns	+
Rashes	n/a	n/a	n/a	ns	+
Cuts	n/a	n/a	n/a	ns	ns
Toileting plan	n/a	n/a	n/a	+	ns
Incontinence pad	n/a	n/a	n/a	ns	+
Bowel incontinence	n/a	n/a	n/a	ns	—
Diarrhea	n/a	n/a	n/a	ns	+
Fecal impaction	n/a	n/a	n/a	ns	ns
Delirium	n/a	n/a	n/a	ns	—
Long-term memory	n/a	n/a	n/a	ns	—
Indicators of depression, anxiety, and sad mood	n/a	n/a	n/a	—	—
Chewing problems	n/a	n/a	n/a	ns	—
N	2,694	2,648	2,519	2,519	245,747
R ²	0.18	0.13	0.10	0.13	0.10
R ² for model ending in readmission	0.16	0.14	0.13	0.17	0.10

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; MDS, Minimum Data Set; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "—" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_291, ASPERISK2_292, ASPERISK2_150.

Table 4-5c. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 60-Day Fixed-Length Episode

Model Characteristic	Model 11	Model 12	Model 13	Model 14	Model 15
Episode length	60-day fixed	60-day fixed	60-day fixed	60-day fixed	60-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	MDS 2.0 variables from crosswalk	MDS 2.0 variables from crosswalk+ additional items	MDS 2.0 variables from crosswalk + additional items
Intercept	+	+	ns	ns	—
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	—	ns	ns	ns	+
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	ns	ns	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	ns	+
Respiratory	ns	ns	ns	ns	—
Cardiovascular	ns	+	ns	ns	ns
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	ns
Kidney & urinary	ns	ns	ns	ns	ns
Infections	ns	+	ns	ns	—
Transplant	+	+	ns	+	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	—
Hematologic	ns	+	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	+
Intensive care unit (ICU)					
ICU days	+	ns	ns	+	+
ICU days squared	—	ns	ns	—	—

(continued)

Table 4-5c. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 11	Model 12	Model 13	Model 14	Model 15
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	+	ns	ns	+
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34,35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43,44,45,189)	ns	ns	ns	ns	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	+
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	ns
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	+	+	+	ns	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111,112)	ns	ns	+	+	+
Acute and chronic renal (HCC135,136,137,138)	ns	ns	+	+	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	+	+	+	+	+
Major treatments					
Hemodialysis	+	ns	ns	ns	+
Total parenteral nutrition	ns	ns	ns	ns	+
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	+	+	+
Turning surfaces—at least one not intact					
Yes	+	ns	n/a	n/a	n/a
Major wounds present	+	+	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	+	ns	ns	ns	ns
Moderately impaired	ns	ns	ns	ns	+
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-5c. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 11	Model 12	Model 13	Model 14	Model 15
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	—	—	—	—	—
Frequent difficulty	—	ns	—	—	—
Some difficulty	—	ns	ns	ns	—
Missing	—	ns	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	—	—	n/a	n/a	n/a
History of falls	+	+	+	+	+
Bowel: indwelling or external device used					
Yes	—	—	ns	ns	+
Bladder incontinence					
Yes	ns	ns	ns	ns	+
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	ns	ns	
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory Status—Impaired	ns	+	+	+	+
Ventilator (weaning or nonweaning)	ns	+	ns	ns	+
Sitting endurance [ref yes, can do without support]					
No, could not do	ns	ns	n/a	n/a	n/a
Yes, can do with support	+	+	n/a	n/a	n/a
Not assessed due to medical restriction	ns	+	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	ns	ns	+
No interview, comatose, or missing	ns	—	n/a	n/a	n/a
Motor measure at admission	—	—	+	+	+

(continued)

Table 4-5c. Predicting PAC Episode Payment and Cost, First PAC Setting = SNF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 11	Model 12	Model 13	Model 14	Model 15
High LTCH or IRF market	ns	ns	ns	ns	—
Prior acute hospitalizations in the last 12 months					
One	ns	ns	ns	ns	+
Two or more	ns	ns	ns	ns	+
Hospital wage index	n/a	+	+	+	+
Additional MDS 2.0 items					
Pressure ulcer highest state in last 7 days = 2	n/a	n/a	n/a	+	+
Skin desensitized to pain or pressure	n/a	n/a	n/a	ns	—
Surgical wounds	n/a	n/a	n/a	—	—
Foot lesions	n/a	n/a	n/a	+	+
Abrasions	n/a	n/a	n/a	—	—
Lesions	n/a	n/a	n/a	ns	+
Rashes	n/a	n/a	n/a	ns	+
Cuts	n/a	n/a	n/a	ns	ns
Toileting plan	n/a	n/a	n/a	+	ns
Incontinence pad	n/a	n/a	n/a	—	+
Bowel incontinence	n/a	n/a	n/a	ns	—
Diarrhea	n/a	n/a	n/a	ns	+
Fecal impaction	n/a	n/a	n/a	+	ns
Delirium	n/a	n/a	n/a	ns	—
Long term memory	n/a	n/a	n/a	ns	—
Indicators of depression, anxiety, and sad mood	n/a	n/a	n/a	ns	—
Chewing problems	n/a	n/a	n/a	ns	—
N	2,694	2,624	2,495	2,495	245,364
R ²	0.17	0.12	0.09	0.12	0.10
R ² for model ending in readmission	0.16	0.14	0.13	0.17	0.10

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; MDS, Minimum Data Set; PAC, post-acute care; PRD, Payment Reform Demonstration; SNF, skilled nursing facility.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "—" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_291, ASPERISK2_292, ASPERISK2_150.

Table 4-6a. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Variable-Length Episode

Model Characteristic	Model 16	Model 17	Model 18	Model 19	Model 20
Episode length	30-day variable	30-day variable	30-day variable	30-day variable	30-day variable
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	IRF-PAI variables from crosswalk	IRF-PAI variables from crosswalk + additional items	IRF-PAI variables from crosswalk + additional items
Intercept	+	+	+	+	+
Age [ref 85+]					
64 and under	—	ns	ns	+	—
65–74	—	ns	+	+	—
75–84	ns	ns	ns	ns	—
Race/ethnicity					
Black or African American	+	+	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	+	+	ns	ns	+
Respiratory	ns	ns	+	+	+
Cardiovascular	+	+	+	+	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	ns	ns	ns	ns	+
Infections	ns	ns	ns	ns	+
Transplant	ns	ns	ns	ns	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	—	—	—	—	—
Intensive care unit (ICU)					
ICU days	ns	ns	ns	ns	+
ICU days squared	ns	ns	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	ns	ns	ns	+

(continued)

Table 4-6a. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 16	Model 17	Model 18	Model 19	Model 20
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	ns	—	ns	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	ns
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	+
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	ns	ns	ns	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	+	+	+	+
Acute and chronic renal (HCC135,136,137,138)	ns	+	+	+	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	+	+	+	+	+
Major treatments					
Hemodialysis	+	+	ns	ns	+
Total parenteral nutrition	ns	+	n/a	n/a	n/a
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	+	ns	n/a	n/a	n/a
Turning surfaces—at least one not intact					
Yes	ns	ns	n/a	n/a	n/a
Major wounds present	ns	ns	n/a	n/a	n/a
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	ns	ns	ns	ns	—
Moderately impaired	ns	ns	ns	ns	ns
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-6a. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 16	Model 17	Model 18	Model 19	Model 20
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	+	ns	ns	ns	+
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty	ns	ns	ns	ns	ns
Missing	ns	ns	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	ns	ns	n/a	n/a	n/a
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	n/a	n/a	n/a
Bladder incontinence					
Yes	+	+	ns	ns	ns
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	+	ns	n/a	n/a	n/a
Respiratory Status—Impaired	+	+	n/a	n/a	n/a
Ventilator (weaning or nonweaning)	—	—	n/a	n/a	n/a
Sitting endurance [ref yes, can do without support]					
No, could not do	+	ns	n/a	n/a	n/a
Yes, can do with support	ns	+	n/a	n/a	n/a
Not assessed due to medical restriction	+	+	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	n/a	n/a	n/a
No interview, comatose, or missing	ns	ns	n/a	n/a	n/a
Motor score at admission	—	—	—	—	—
High LTCH or IRF market	ns	ns	ns	ns	—
Hospital wage index	n/a	+	+	+	+
Prior acute hospitalizations in the last 12 months					
One	ns	+	+	+	+
Two or more	+	+	+	+	+

(continued)

Table 4-6a. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 16	Model 17	Model 18	Model 19	Model 20
Additional IRF-PAI items					
Bowel assistance at admission	n/a	n/a	n/a	ns	+
Bladder level of assistance	n/a	n/a	n/a	ns	+
Bowel frequency of accidents	n/a	n/a	n/a	ns	+
n	3,107	3,069	2,533	2,533	51,037
R ²	0.26	0.24	0.22	0.22	0.20
R ² for model ending in readmission	0.40	0.35	0.31	0.32	0.26

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; IRF-PAI, IRF-Patient Assessment Instrument; MDS, Minimum Data Set; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "-" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_293, ASPERISK2_294, ASPERISK2_151.

Table 4-6b. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Fixed-Length Episode

Model Characteristic	Model 21	Model 22	Model 23	Model 24	Model 25
Episode length	30-day fixed	30-day fixed	30-day fixed	30-day fixed	30-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	IRF-PAI variables from crosswalk	IRF-PAI variables from crosswalk + additional items	IRF-PAI variables from crosswalk + additional items
Intercept	+	+	+	+	+
Age [ref 85+]					
64 and under	—	+	+	+	—
65–74	—	+	+	+	—
75–84	ns	ns	ns	ns	—
Race/ethnicity					
Black or African American	ns	ns	ns	ns	ns
Gender					
Male	ns	+	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	+	+	+	+	+
Respiratory	ns	ns	ns	ns	+
Cardiovascular	+	+	+	+	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	ns	ns	ns	ns	+
Infections	ns	ns	+	+	+
Transplant	ns	ns	+	ns	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	+	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	—	—	—	ns
Intensive care unit (ICU)					
ICU days	+	ns	ns	ns	+
ICU days squared	ns	ns	ns	ns	—

(continued)

Table 4-6b. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 21	Model 22	Model 23	Model 24	Model 25
Comorbid condition categories					
metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	ns	ns	ns	+
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34,35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43,44,45,189)	—	—	—	—	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	ns
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	+
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	ns
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	+	+	+	+
Stroke (HCC99,100,101,102,103,104)	+	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111,112)	ns	+	+	+	+
Acute and chronic renal (HCC135,136,137,138)	ns	+	+	+	+
Cellulitis (HCC120,164)	—	ns	ns	ns	+
Urinary tract infection (HCC141,144)	ns	+	+	+	+
Major treatments					
Hemodialysis	+	+	ns	ns	+
Total parenteral nutrition	ns	ns	n/a	n/a	n/a
Central line management	ns	+	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	n/a	n/a	n/a
Turning surfaces—at least one not intact					
Yes	ns	+	n/a	n/a	n/a
Major wounds present	+	+	n/a	n/a	n/a
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	+	+	—	—	—
Moderately impaired	ns	ns	ns	ns	+
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-6b. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 21	Model 22	Model 23	Model 24	Model 25
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	ns	—	ns	ns	ns
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty	ns	ns			
Missing	—	—	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	ns	ns	n/a	n/a	n/a
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	n/a	n/a	n/a
Bladder incontinence					
Yes	+	+	—	—	+
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	+	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	+	+	n/a	n/a	n/a
Respiratory Status—Impaired	+	+	n/a	n/a	n/a
Ventilator (weaning or nonweaning)	—	—	n/a	n/a	n/a
Sitting endurance [ref yes, can do without support]					
No, could not do	+	+	n/a	n/a	n/a
Yes, can do with support	ns	+	n/a	n/a	n/a
Not assessed due to medical restriction	+	+	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	n/a	n/a	n/a
No interview, comatose, or missing	ns	ns	n/a	n/a	n/a
Motor score at admission	—	—	—	—	—
High LTCH or IRF market	ns	ns	ns	ns	—
Hospital wage index	n/a	+	+	+	+

(continued)

Table 4-6b. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 21	Model 22	Model 23	Model 24	Model 25
Prior acute hospitalizations in the last 12 months					
One	ns	ns	+	+	ns
Two or more	ns	ns	ns	ns	+
Additional IRF-PAI items	n/a	n/a	n/a	ns	ns
Bowel assistance at admission	n/a	n/a	n/a	ns	+
Bladder level of assistance	n/a	n/a	n/a	ns	+
Bowel frequency of accidents	n/a	n/a	n/a	ns	+
n	3,107	3,083	2,545	2,545	51,091
R ²	0.40	0.36	0.33	0.33	0.30
R ² for model ending in readmission	0.42	0.36	0.31	0.31	0.26

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; IRF-PAI, IRF-Patient Assessment Instrument; MDS, Minimum Data Set; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "-" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_293, ASPERISK2_294, ASPERISK2_151.

Table 4-6c. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 60-Day Fixed-Length Episode

Model Characteristic	Model 26	Model 27	Model 28	Model 29	Model 30
Episode length	60-day fixed	60-day fixed	60-day fixed	60-day fixed	60-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	IRF-PAI variables from crosswalk	IRF-PAI variables from crosswalk + additional items	IRF-PAI variables from crosswalk + additional items
Intercept	+	+	+	+	+
Age [ref 85+]					
64 and under	ns	+	+	+	—
65–74	ns	+	+	+	—
75–84	ns	ns	ns	ns	—
Race/ethnicity					
Black or African American	ns	ns	ns	ns	ns
Gender					
Male	ns	+	+	+	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	+	+	+	+	+
Respiratory	ns	ns	ns	+	+
Cardiovascular	+	+	+	+	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	ns	ns	ns	ns	+
Infections	ns	ns	ns	ns	+
Transplant	ns	+	+	+	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	—	—	—	—	—
Intensive care unit (ICU)					
ICU days	+	ns	ns	ns	+
ICU days squared	+	ns	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	ns	ns	ns	ns	+

(continued)

Table 4-6c. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 26	Model 27	Model 28	Model 29	Model 30
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34,35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43,44,45,189)	—	—	—	—	+
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	ns
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	+
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	+	+	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	+	+	+	+	+
Stroke (HCC99,100,101,102,103,104)	+	ns	ns	ns	+
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111,112)	ns	+	+	+	+
Acute and chronic renal (HCC135,136,137,138)	ns	+	+	+	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	+	+	+	+	+
Major treatments					
Hemodialysis	ns	+	ns	ns	+
Total parenteral nutrition	ns	ns	n/a	n/a	n/a
Central line management	ns	+	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	n/a	n/a	n/a
Turning surfaces—at least one not intact					
Yes	ns	ns	n/a	n/a	n/a
Major wounds present	ns	+	n/a	n/a	n/a
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	+	+	ns	ns	—
Moderately impaired	ns	ns	ns	ns	+
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-6c. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 26	Model 27	Model 28	Model 29	Model 30
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	ns	—	ns	ns	+
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty	ns	ns			
Missing	ns	—	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	n/a	n/a	n/a
Mobility (ambulation/wheelchair): dependent	ns	ns	n/a	n/a	n/a
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	n/a	n/a	n/a
Bladder incontinence					
Yes	+	ns	ns	ns	+
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	+	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	+	+	n/a	n/a	n/a
Respiratory Status—Impaired	+	+	n/a	n/a	n/a
Ventilator (weaning or nonweaning)	—	—	n/a	n/a	n/a
Sitting endurance [ref yes, can do without support]					
No, could not do	+	+	n/a	n/a	n/a
Yes, can do with support	ns	+	n/a	n/a	n/a
Not assessed due to medical restriction	ns	+	n/a	n/a	n/a
Possible depression present					
Yes	+	+	n/a	n/a	n/a
No interview, comatose, or missing	+	ns	n/a	n/a	n/a
Motor score at admission	—	—	—	—	—
High LTCH or IRF market	ns	ns	ns	ns	—
Hospital wage index	n/a	+	+	+	+
Prior acute hospitalizations in the last 12 months					
One	ns	+	+	+	ns
Two or more	ns	ns	ns	ns	+

(continued)

Table 4-6c. Predicting PAC Episode Payment and Cost, First PAC Setting = IRF, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 26	Model 27	Model 28	Model 29	Model 30
Additional IRF-PAI items					
Bowel assistance at admission	n/a	n/a	n/a	ns	+
Bladder level of assistance	n/a	n/a	n/a	ns	+
Bowel frequency of accidents	n/a	n/a	n/a	ns	+
n	3,107	3,080	2,542	2,542	51,070
R ²	0.36	0.32	0.30	0.30	0.27
R ² for model ending in readmission	0.43	0.36	0.32	0.32	0.26

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; IRF, inpatient rehabilitation facility; IRF-PAI, IRF-Patient Assessment Instrument; MDS, Minimum Data Set; LTCH, long-term care hospital; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "-" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_293, ASPERISK2_294, ASPERISK2_151.

Table 4-7a. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Variable-Length Episode

Model Characteristic	Model 31	Model 32	Model 33	Model 34	Model 35
Episode length	30-day variable	30-day variable	30-day variable	30-day variable	30-day variable
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	OASIS-B variables from crosswalk	OASIS-B variables from crosswalk + additional items	OASIS-B variables from crosswalk + additional items
Intercept	+	ns	ns	ns	ns
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	ns	ns	ns	ns	+
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	ns	ns	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	ns	ns	ns	ns	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	ns	+
Respiratory	ns	ns	ns	ns	+
Cardiovascular	ns	ns	ns	ns	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	ns	ns	+	+	+
Infections	ns	ns	ns	ns	+
Transplant	ns	ns	ns	ns	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	—
Intensive care unit (ICU)					
ICU days	ns	ns	ns	ns	+
ICU days squared	—	—	ns	ns	ns
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	+	+	+	+	+

(continued)

Table 4-7a. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 31	Model 32	Model 33	Model 34	Model 35
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	ns	+	+	ns
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	+
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	ns
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	+	ns	ns	ns	+
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	+	+	+	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	ns
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	ns	ns	ns	+
Acute and chronic renal (HCC135,136,137,138)	ns	ns	ns	ns	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	ns	ns	ns	ns	+
Major treatments					
Hemodialysis	ns	ns	na	na	na
Total parenteral nutrition	ns	ns	na	na	na
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	ns	ns	+
Turning surfaces—at least one not intact					
Yes	—	—	n/a	n/a	n/a
Major wounds present	ns	ns	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	ns	ns	—	ns	—
Moderately impaired	ns	ns	ns	ns	—
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-7a. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 31	Model 32	Model 33	Model 34	Model 35
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	ns	ns	ns	ns	—
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty	ns	ns	ns	ns	+
Missing	—	—	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	+	+	—
Mobility (ambulation/wheelchair): dependent	ns	ns	—	ns	ns
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	ns	ns	+
Bladder incontinence					
Yes	ns	ns	ns	+	+
Swallowing [ref no impairment]					
Symptoms of disorder present	—	ns	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory status—impaired	+	+	+	+	+
Ventilator (weaning or nonweaning)	n/a	n/a	n/a	+	ns
Sitting endurance [ref yes, can do without support]					
No, could not do	ns	ns	n/a	n/a	n/a
Yes, can do with support	ns	ns	n/a	n/a	n/a
Not assessed due to medical restriction	ns	ns	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	ns	ns	ns
No interview, comatose, or missing	ns	—	n/a	n/a	n/a
Motor measure at admission	—	—	+	+	+
High LTCH or IRF market	+	ns	ns	ns	—
Prior acute hospitalizations in the last 12 months					
One	+	+	+	+	+
Two or more	+	+	+	+	+
Hospital wage index	n/a	ns	ns	ns	+

(continued)

Table 4-7a. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Variable-Length Episode (continued)

Model Characteristic	Model 31	Model 32	Model 33	Model 34	Model 35
Additional OASIS-B items					
Grooming	n/a	n/a	n/a	ns	+
Status of most problematic pressure ulcer level 1	n/a	n/a	n/a	ns	ns
Status of most problematic pressure ulcer level 2	n/a	n/a	n/a	n/a	+
Status of most problematic pressure ulcer level 3	n/a	n/a	n/a	n/a	+
Memory deficit	n/a	n/a	n/a	ns	—
Impaired decision making	n/a	n/a	n/a	ns	+
Ostomy for bowel elimination	n/a	n/a	n/a	ns	+
Depressive feelings reported or observed in patient	n/a	n/a	n/a	—	+
Skin lesion/open wound	n/a	n/a	n/a	ns	—
n	1,831	1,775	1,687	1,687	226,689
R ²	0.10	0.09	0.08	0.09	0.06
R ² for model ending in readmission	0.11	0.08	0.07	0.07	0.05

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; OASIS, Outcome Assessment Information Set; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "—" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_295, ASPERISK2_296, ASPERISK2_178.

Table 4-7b. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Fixed-Length Episode

Model Characteristic	Model 36	Model 37	Model 38	Model 39	Model 40
Episode length	30-day fixed	30-day fixed	30-day fixed	30-day fixed	30-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	OASIS-B variables from crosswalk	OASIS-B variables from crosswalk + additional items	OASIS-B variables from crosswalk + additional items
Intercept	+	+	ns	ns	+
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	ns	ns	ns	ns	+
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	+	+	+	+	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	—	—	—	—	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	+	+
Respiratory	ns	ns	+	+	+
Cardiovascular	ns	ns	+	+	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	ns	+	+	+	+
Infections	—	ns	ns	ns	+
Transplant	ns	ns	ns	ns	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	—
Intensive care unit (ICU)					
ICU days	ns	ns	ns	ns	+
ICU days squared	ns	ns	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	+	ns	+	+	ns

(continued)

Table 4-7b. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 36	Model 37	Model 38	Model 39	Model 40
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	ns	ns	ns	—
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	—
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	—
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	ns
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	ns	ns	ns	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	ns
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	ns	ns	ns	+
Acute and chronic renal (HCC135,136,137,138)	ns	ns	ns	ns	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	ns	ns	ns	ns	+
Major treatments					
Hemodialysis	ns	ns	n/a	n/a	n/a
Total parenteral nutrition	ns	ns	n/a	n/a	n/a
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	ns	ns	+
Turning surfaces—at least one not intact					
Yes	ns	ns	n/a	n/a	n/a
Major wounds present	+	ns	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	ns	ns	ns	ns	—
Moderately impaired	ns	ns	ns	ns	—
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-7b. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 36	Model 37	Model 38	Model 39	Model 40
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	ns	ns	ns	ns	—
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty					+
Missing	—	ns	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	+	+	—
Mobility (ambulation/wheelchair): dependent	ns	ns	ns	ns	ns
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	ns	ns	+
Bladder incontinence					
Yes	+	ns	ns	ns	ns
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory status—impaired	ns	ns	+	+	+
Ventilator (weaning or nonweaning)	n/a	n/a	n/a	+	ns
Sitting endurance [ref yes, can do without support]					
No, could not do	—	ns	n/a	n/a	n/a
Yes, can do with support	ns	ns	n/a	n/a	n/a
Not assessed due to medical restriction	ns	ns	n/a	n/a	n/a
Possible depression present					
Yes	—	ns	ns	ns	ns
No interview, comatose, or missing	ns	ns	n/a	n/a	n/a
Motor measure at admission	—	—	ns	+	+
High LTCH or IRF market	ns	ns	ns	ns	—
Prior acute hospitalizations in the last 12 months					
One	ns	ns	ns	ns	+
Two or more	+	ns	ns	ns	+
Hospital wage index	n/a	ns	ns	ns	+

(continued)

Table 4-7b. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 30-Day Fixed-Length Episode (continued)

Model Characteristic	Model 36	Model 37	Model 38	Model 39	Model 40
Additional OASIS-B items					
Grooming	n/a	n/a	n/a	—	+
Status of most problematic pressure ulcer level 1	n/a	n/a	n/a	ns	—
Status of most problematic pressure ulcer level 2	n/a	n/a	n/a	ns	+
Status of most problematic pressure ulcer level 3	n/a	n/a	n/a	ns	+
Memory deficit	n/a	n/a	n/a	ns	—
Impaired decision making	n/a	n/a	n/a	ns	ns
Ostomy for bowel elimination	n/a	n/a	n/a	ns	+
Depressive feelings reported or observed in patient	n/a	n/a	n/a	ns	+
Skin lesion/open wound	n/a	n/a	n/a	ns	+
n	1,831	1,776	1,688	1,688	226,725
R ²	0.09	0.06	0.05	0.06	0.04
R ² for model ending in readmission	0.14	0.12	0.12	0.13	0.06

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; OASIS, Outcome Assessment Information Set; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "—" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_295, ASPERISK2_296, ASPERISK2_178.

Table 4-7c. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 60-Day Fixed-Length Episode

Model Characteristic	Model 41	Model 42	Model 43	Model 44	Model 45
Episode length	60-day fixed	60-day fixed	60-day fixed	60-day fixed	60-day fixed
Sample	PAC PRD	PAC PRD	PAC PRD	PAC PRD	National
Dependent variable	PAC episode payment	PAC episode cost	PAC episode cost	PAC episode cost	PAC episode cost
Independent variables	CARE variables	CARE variables	OASIS-B variables from crosswalk	OASIS-B variables from crosswalk + additional items	OASIS-B variables from crosswalk + additional items
Intercept	+	+	ns	ns	+
Age [ref 85+]					
64 and under	ns	ns	ns	ns	+
65–74	ns	ns	ns	ns	+
75–84	ns	ns	ns	ns	+
Race/ethnicity					
Black or African American	ns	ns	ns	ns	+
Gender					
Male	ns	ns	ns	ns	+
Medicaid is a current payment source (fee-for-service or HMO)					
Yes	—	—	—	—	+
Primary medical diagnosis groups [ref orthopedic]					
Neurologic	ns	ns	ns	ns	+
Respiratory	ns	ns	+	+	+
Cardiovascular	ns	ns	+	+	+
Integumentary	ns	ns	ns	ns	+
Endocrine	ns	ns	ns	ns	+
Kidney and urinary	+	ns	+	+	+
Infections	ns	ns	ns	ns	+
Transplant	ns	ns	ns	ns	+
Gastrointestinal and hepatobiliary	ns	ns	ns	ns	+
Hematologic	ns	ns	ns	ns	+
Other	ns	ns	ns	ns	+
Primary diagnosis—surgical indicator	ns	ns	ns	ns	—
Intensive care unit (ICU)					
ICU days	ns	ns	ns	ns	+
ICU days squared	—	—	ns	ns	—
Comorbid condition categories					
Metabolic, diabetes, other endocrine (HCC21,23,24,17,18,19,20,26)	+	+	+	+	+

(continued)

Table 4-7c. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 41	Model 42	Model 43	Model 44	Model 45
Liver, other gastrointestinal (HCC27,28,30,29,31,32,33,34, 35)	ns	ns	ns	ns	ns
Ortho infection, rheum, severe skeletal, musculoskeletal, amputation (HCC39,40,41,42,43, 44,45,189)	ns	+	+	+	—
Psych/depression (HCC54,57,58,59,60,55,56)	ns	ns	ns	ns	—
Head and spine injury (HCC166,167,70,71,72)	ns	ns	ns	ns	—
Polyneuropathy, seizure, other neuro (HCC75,79,73,74,76,77,78)	ns	ns	ns	ns	ns
Ischemic heart disease, vascular (HCC84,86,87,106,107,108)	ns	ns	ns	ns	+
Stroke (HCC99,100,101,102,103,104)	ns	ns	ns	ns	ns
Pneumonia, pleural effusion, other resp (HCC114,115,116,117,110,111, 112)	ns	ns	ns	ns	+
Acute and chronic renal (HCC135,136,137,138)	ns	ns	ns	ns	+
Cellulitis (HCC120,164)	ns	ns	ns	ns	+
Urinary tract infection (HCC141,144)	ns	ns	ns	ns	+
Major treatments					
Hemodialysis	ns	ns	n/a	n/a	n/a
Total parenteral nutrition	ns	+	n/a	n/a	n/a
Central line management	ns	ns	n/a	n/a	n/a
Severe pressure ulcer present					
Yes	ns	ns	ns	ns	+
Turning surfaces—at least one not intact					
Yes	—	ns	n/a	n/a	n/a
Major wounds present	ns	ns	ns	ns	+
Cognitive status (Brief Interview for Mental Status [BIMS]) [ref intact]					
Severely impaired	ns	ns	ns	ns	—
Moderately impaired	ns	ns	ns	ns	—
Missing	ns	ns	n/a	n/a	n/a

(continued)

Table 4-7c. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 41	Model 42	Model 43	Model 44	Model 45
Expression [ref without difficulty]					
Rarely expresses self or is very difficult to understand	ns	ns	ns	ns	+
Frequent difficulty	ns	ns	ns	ns	ns
Some difficulty	ns	ns	ns	ns	—
Missing	ns	ns	n/a	n/a	n/a
Prior functioning					
Self-care function: dependent	ns	ns	+	+	—
Mobility (ambulation/wheelchair): dependent	ns	ns	ns	ns	ns
History of falls	ns	ns	n/a	n/a	n/a
Bowel: indwelling or external device used					
Yes	ns	ns	ns	ns	+
Bladder incontinence					
Yes	ns	ns	ns	ns	ns
Swallowing [ref no impairment]					
Symptoms of disorder present	ns	ns	n/a	n/a	n/a
Swallowing: NPO—intake not by mouth	ns	ns	ns	ns	+
Respiratory status—impaired	+	+	ns	ns	+
Ventilator (weaning or nonweaning)	n/a	n/a	n/a	+	ns
Sitting endurance [ref yes, can do without support]					
No, could not do	ns	ns	n/a	n/a	n/a
Yes, can do with support	ns	ns	n/a	n/a	n/a
Not assessed due to medical restriction	ns	ns	n/a	n/a	n/a
Possible depression present					
Yes	ns	ns	ns	ns	ns
No interview, comatose, or missing	—	—	n/a	n/a	n/a
Motor measure at admission	—	—	+	+	+
High LTCH or IRF market	ns	ns	ns	ns	—
Prior acute hospitalizations in the last 12 months					
One	ns	ns	ns	ns	+
Two or more	+	+	+	+	+
Hospital wage index	n/a	ns	ns	ns	+

(continued)

Table 4-7c. Predicting PAC Episode Payment and Cost, First PAC Setting = HHA, 60-Day Fixed-Length Episode (continued)

Model Characteristic	Model 41	Model 42	Model 43	Model 44	Model 45
Additional OASIS-B items					
Grooming	n/a	n/a	n/a	—	+
Status of most problematic pressure ulcer level 1	n/a	n/a	n/a	ns	+
Status of most problematic pressure ulcer level 2	n/a	n/a	n/a	ns	+
Status of most problematic pressure ulcer level 3	n/a	n/a	n/a	ns	+
Memory deficit	n/a	n/a	n/a	ns	+
Impaired decision making	n/a	n/a	n/a	ns	ns
Ostomy for bowel elimination	n/a	n/a	n/a	ns	ns
Depressive feelings reported or observed in patient	n/a	n/a	n/a	ns	+
Skin lesion/open wound	n/a	n/a	n/a	ns	+
N	1,831	1,776	1,688	1,688	227,745
R ²	0.09	0.06	0.06	0.06	0.04
R ² for model ending in readmission	0.14	0.12	0.12	0.13	0.06

NOTES: CARE, Continuity Assessment Record and Evaluation; HCC, hierarchical condition category; HHA, home health agency; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital; OASIS, Outcome Assessment Information Set; PAC, post-acute care; PRD, Payment Reform Demonstration.

^a A "+" indicates that the variable was included in the model, was significant, and was associated with higher PAC episode payments or costs.

^b A "-" indicates that the variable was included in the model, was significant, and was associated with lower PAC episode payments or costs.

^c A "ns" indicates that the variable was used in the mode but was not significant.

^d A "n/a" indicates that the variable was not used in the model.

^e Primary diagnosis variables, comorbid condition categories, demographics, and intensive care days are based on claims and were not part of the crosswalking exercise.

SOURCE: ASPERISK2_290, ASPERISK2_235, ASPERISK2_295, ASPERISK2_296, ASPERISK2_178.

5. DISCUSSION

The goal of this project was to provide additional information to ASPE and CMS on the potential to risk adjust PAC episode payments and costs. The CARE data collected in the PAC PRD provide a unique opportunity to use the same set of items to predict PAC episode payments and costs, regardless of the setting in which a beneficiary begins an episode; however, CARE data collection across PAC settings is not currently required by CMS. A uniform assessment instrument is the ideal for measuring patient characteristics across settings, but in its absence, the item crosswalk approach used in this work was a useful tool to understand the potential to risk adjust episodes using information currently available and to understand the generalizability of the results of the risk adjustment models developed using the PAC PRD sample.

In the absence of CARE, the item crosswalk was a way to use assessment data currently collected in PAC settings to test the ability of conceptually similar items to predict PAC episode costs. There are certainly limitations to the crosswalk approach. In some cases, it was not possible to identify items analogous to those used in the CARE-based risk adjustment models in the MDS 2.0, IRF-PAI, and OASIS-B. In many other cases, it was possible to identify items conceptually similar to CARE items on the MDS 2.0, IRF-PAI, and OASIS-B, but there were important differences in the wording of the item or response categories, and there were the key differences in the time periods over which the data were collected. Also, by using the crosswalk approach, it was necessary to run separate models based on the first setting of PAC in the episode because the variables used in the models were specific to each assessment instrument. This setting-specific modeling approach is not ideal for risk adjusting PAC episodes broadly, but it was used for the purposes of this work as we explored the potential to use information currently collected in each PAC setting. Earlier work has looked at modeling approaches for PAC episodes assuming the availability of uniform information from all PAC settings. This work has included looking at the models including all PAC settings regardless of the first PAC setting in the episode, as well as models for patients beginning PAC service use in inpatient settings compared with models for patients beginning PAC service use in an HHA (Morley et al., 2011).

The limitations to the crosswalk approach are clear, but the goal of its use was to test the potential to predict PAC episode costs in the absence of uniform information. The results of these analyses using the item crosswalk do show similarities in the ability to predict PAC episode costs using MDS 2.0, IRF-PAI, and OASIS-B items to what was found using CARE items, but the results also show the slight improvement in prediction when using CARE. This indicates that the CARE items may contain greater specificity or more information that can be used to predict PAC episode costs than is available from the MDS 2.0, IRF-PAI, or OASIS-B.

The results of this work demonstrate that PAC episode payments and PAC episode costs are correlated and that similar results can be found using both dependent variables. The results of this work also support the ability to generalize these results outside of the PAC PRD data sample. The results reveal that models using items analogous to CARE items from the MDS 2.0, IRF-PAI, and OASIS-B perform similarly whether run on the PAC PRD sample or the national sample. This information will be useful to ASPE and CMS as they consider approaches to episode-based risk adjustment more broadly.

This work has several limitations. The beneficiary sample used in these analyses included beneficiaries with CARE data at acute hospital discharge or at admission to the first PAC setting, although the item crosswalk was developed using data from admission to the first PAC setting. Therefore, some beneficiaries with both CARE data at acute hospital discharge and MDS 2.0, IRF-PAI, or OASIS-B at PAC admission, which may introduce some differences given that the staff collecting the data may differ across settings (e.g., nurses, therapists). Note that analysis of the reliability of CARE items across settings and across different licensure types and levels is the subject of CMS analysis. The diagnoses and comorbidity groupings used in this work were developed on the relatively small PAC PRD sample, and refinement to these groupings may be warranted with additional clinician feedback and analysis on larger samples.

Another limitation to this work is related to the construction of the cost variables. The dependent variable was constructed using data available on the cost reports. Cost report data are known have limitations, including missing data; however, our dependent variable construction was based on the data available in the cost reports. Our approach included methods for handling outliers and missing data to the extent possible.

Finally, the work presented here was based on the MDS 2.0, IRF-PAI, and OASIS-B, which were the assessment instruments collected during the years of our analysis. However, the MDS 3.0 and OASIS-C are now collected in SNFs and HHAs, respectively, and the items on the IRF-PAI have also changed somewhat since the years of data analyzed in this report. Given these changes, future analyses would need to be revised to reflect items on the more recent assessment instruments.

In future work, RTI will be working with ASPE to develop risk adjustment models for beneficiaries with a first PAC setting of LTCH using the same sample of data. Because no assessment data were collected for beneficiaries in LTCHs at the time of this data collection, we will compare the results of risk adjustment models using CARE to those of models including claims-based variables only. RTI will also consider additional refinements to the models, based on feedback from clinicians, to continue to support an understanding of approaches to risk adjustment to predict PAC episode payments and costs.

REFERENCES

Gage, B., Morley, M., Ingber, M., & Smith, L. (2011, April). *Post-acute care episodes expanded analytic file. Final report*. Prepared for the Assistant Secretary for Planning and Evaluation (ASPE). Project Officer Susan Bogasky. Waltham, MA: RTI International. Retrieved from <http://aspe.hhs.gov/health/reports/2011/PACexpanded/index.pdf>

Gage, B., Morley, M., Smith, L., Ingber, M. J., Deutsch, A., Kline, T., ..., & Mallinson, T. (2012, March). *Post-Acute Care Payment Reform Demonstration. Final Report*. Prepared for the Centers for Medicare & Medicaid Services (CMS). Project Officer Shannon Flood. Waltham, MA: RTI International. Retrieved from http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Research-Reports-Items/PAC_Payment_Reform_Demo_Final.html

Morley, M., Coomer, N., Gage, B., et al. (2011, August). *Post-acute care episode risk adjustment using CARE assessment data. Final report*. Prepared for the Assistant Secretary for Planning and Evaluation (ASPE). Project Officer Susan Bogasky. Waltham, MA: RTI International.

Morley, M., Gage, B., Smith, L., Spain, P., & Ingber, M. (2009, November). *Post acute care episodes. Final report*. Prepared for the Assistant Secretary for Planning and Evaluation (ASPE). Project Officer Susan Bogasky. Waltham, MA: RTI International. Retrieved from <http://aspe.hhs.gov/health/reports/09/pacepifinal/report.pdf>

Morris, J. N., Fries, B. E., Mehr, D. R., Hawes, C., Phillips, C., Mor, V., & Lipsitz, L. A. (1994). MDS cognitive performance scale. *Journal of Gerontology, 49*, M174–M182.