

Designing a Unified Prospective Payment System for Postacute Care

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*A report by staff from the Urban Institute for the
Medicare Payment Advisory Commission*

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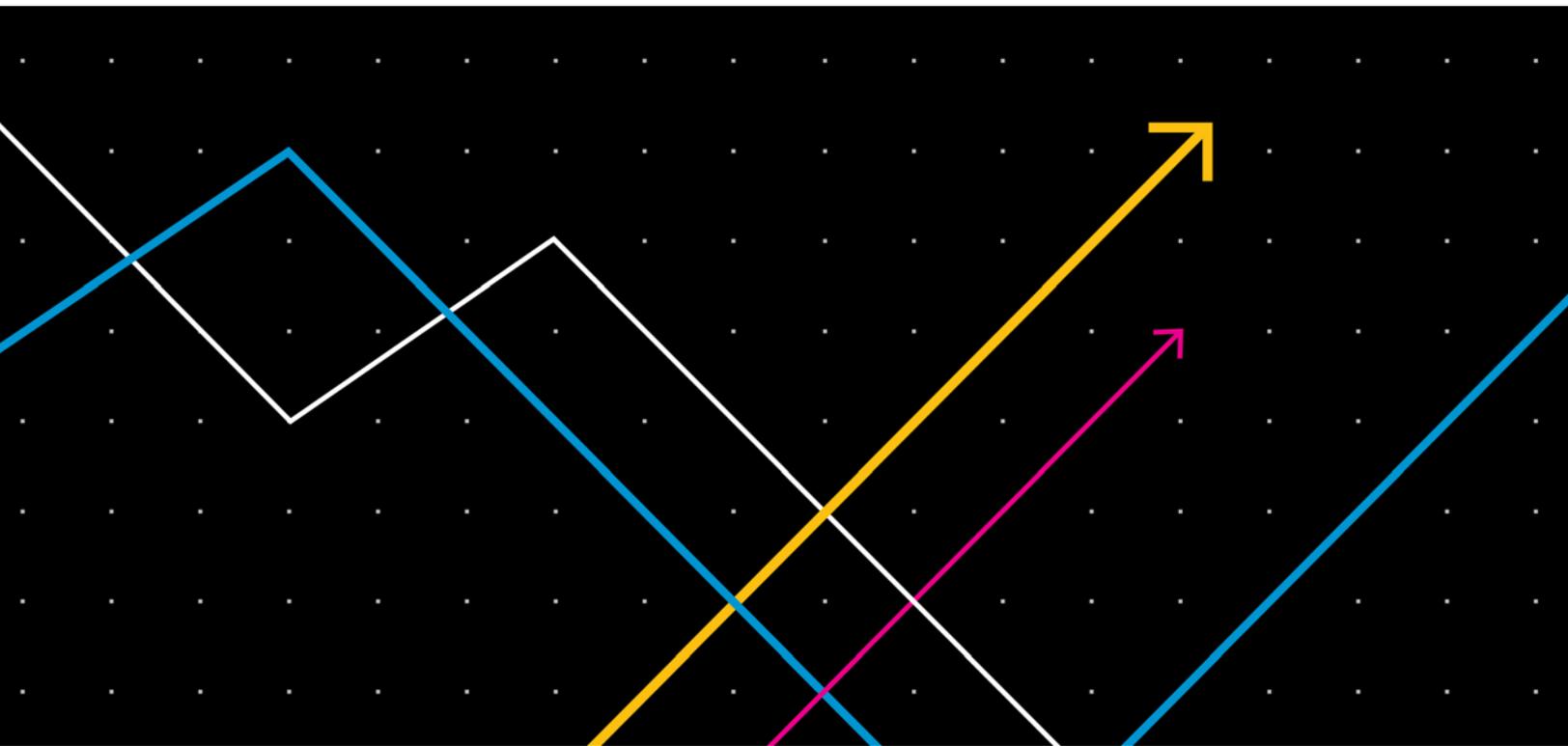
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RESEARCH REPORT

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Designing a Unified Prospective Payment System for Postacute Care

In this report, we provide details of the methods used in the Medicare Payment Advisory Commission (MedPAC) report to Congress on a unified payment system for post-acute care.¹ The analysis was conducted to comply with the Improving Medicare Post-Acute Care Transformation Act of 2014 in which Congress asked for guidance on how to establish a unified payment system that spans postacute care settings. The law requires that MedPAC evaluate and recommend features of a unified prospective payment system (PPS) using the uniform assessment data gathered during the Centers for Medicare and Medicaid Services' Post-Acute Care Payment Reform Demonstration (PAC-PRD) completed in 2011. The law also requires MedPAC to consider, to the extent feasible, the impacts of moving from setting-specific PPSs to a unified payment system.

Working with staff from MedPAC, we carried out the following strategy to fulfill the statutory requirements to use the PAC-PRD data and model the impact of doing so (Table 1):

- First, to evaluate and recommend features of a postacute care (PAC) PPS, we developed a “full” model to predict the costs of stays using the unique data in the PAC-PRD and existing administrative data, including claims, beneficiary risk scores, and demographic information from enrollment files. The ratios of the average predicted costs to the average actual costs of stays were used to establish a relative weight for each stay, measuring how the predicted cost of any given stay compares with the average cost. When used to establish payments, these relative weights would raise or lower payment for the stay relative to the average “base” payment. The purpose of this step was to establish the relative costs of stays and test the feasibility of a PAC PPS.
- Second, because common assessment data are not available for the vast majority of PAC encounters, we built another model using only administrative data (the “administrative model”) and analyze the same PAC-PRD stays used in the full model.
- Third, we compared the accuracy of predicted costs using the full model with the accuracy of predicted costs using the administrative model for the same stays. The purpose of this step was to determine if the administrative model could explain a similar share of the variation in costs across stays and if it could be used to establish payments that on average equaled the costs of stays for the broad patient groups we examined. We found that the administrative model was

¹ Medicare Payment Advisory Commission. *Report to the Congress: Medicare and the Health Care Delivery System*. Washington, DC: Medicare Payment Advisory Commission). Chapter 3, 2016.

almost as accurate as the full model and therefore could be used to estimate the impact of a PAC PPS using the universe of PAC stays from 2013.

- Finally, to analyze the impact of a PAC PPS on patients and providers, we compared actual 2013 payments to PAC providers with simulated PAC PPS payments based on the predicted costs using the administrative model. We also compared our PAC PPS payments to the actual cost of stays to assess whether PAC PPS payments would cover the actual costs of stays. In our impact analyses, we assumed that implementation of the PAC PPS would be budget neutral (i.e., total payments under the unified PPS would equal total actual spending in 2013); we also assumed no changes in provider behavior.

The details of the methodology are provided below, followed by presentation of the findings.

TABLE 1

Overview of Mandate and Approach to the Analyses

	Mandate	Methodology	Purpose
1.	Evaluate and recommend features of a PAC PPS using data from the PAC-PRD	<ul style="list-style-type: none"> “Full” model uses data from PAC-PRD sample to predict relative costs of stays 	<ul style="list-style-type: none"> Use unique data in the PAC-PRD to test feasibility of a PAC PPS
2.	Consider the impact of implementing a PAC PPS	<ul style="list-style-type: none"> “Administrative” model uses only existing data to predict relative costs of stays (in PAC-PRD sample) “Full” and “administrative” models using the same PAC-PRD stays are compared If accuracy is similar, use “administrative” model on 2013 PAC stays to estimate effects 	<ul style="list-style-type: none"> Assess the accuracy of administrative model (without the unique data), which could be used on a large number of stays Estimate impact using a large number of stays

Note: PAC = Postacute care; PPS = prospective payment system; PRD = Payment Reform Demonstration.

Data and Methods for Cost Modeling and Analysis

Estimating the Costs of PAC-PRD Stays

The final sample for the analysis of the PAC-PRD stays included 107 providers and 6,409 stays across the four settings—home health agencies (HHAs), skilled nursing facilities (SNFs), inpatient rehabilitation

facilities (IRFs), and long-term care hospitals (LTCHs). Data were collected by Research Triangle Institute between 2008 and 2010.

The PAC-PRD sample is not nationally representative: stays in IRFs and LTCHs are overrepresented while SNF stays are underrepresented compared with their share of all PAC stays nationally. We weighted the PAC-PRD stays so that the weighted sample distribution across settings matches that of the 2013 national distribution across settings of all PAC stays (Table 2).

TABLE 2

Distribution of PAC-PRD Sample across Settings

Setting	N (percentage of sample)	Percentage of population	Weight
Home health agencies	3,867 (60%)	70%	1.16
Skilled nursing facilities	774 (12%)	25%	2.07
Inpatient rehabilitation facilities	1,062 (17%)	4%	0.241
Long-term care hospitals	706 (11%)	1%	0.091

Source: PAC-PRD data and 2013 Standard Analytic Files.

Our modeled PAC PPS payments are based on multivariate models that relate routine and ancillary costs per stay to characteristics of the patient and stay. To estimate therapy and nontherapy ancillary (NTA) costs for institutional settings, we converted charges from the PAC claims to costs using department-specific cost-to-charge ratios from each provider’s Medicare cost report. Where department-specific cost-to-charge ratios were not available, we used cost-to-charge ratios calculated at a higher level of aggregation (e.g., all therapy).

To estimate therapy costs for HHAs, we converted the charges reported on the Datalink file of claims and assessments to costs using average charges per visit by type (physical therapy, occupational therapy, or speech therapy) from the Datalink file and average costs per visit from the provider’s Medicare cost report. NTA costs are not calculated for HHAs, because the largest component of NTA, drugs, is not covered by Medicare.

Routine costs were estimated differently because SNF, IRF, and LTCH claims do not include patient-level measures of routine services (the claims include a flat daily room and board charge). We calculated an average routine cost per day from each provider’s Medicare cost report and multiplied that by the average length of stay for stays in the PAC-PRD for that provider. Then, using the routine resource use information from the PAC-PRD, we developed a relative weight for each stay and adjusted the stay’s routine cost up or down relative to the facility average. The relative weight measured each stay’s relative routine resource use compared with all stays for that provider.

All costs were standardized for differences in wages and adjusted for the growth in costs across the three years of the data collection. The costs per stay include overhead costs and, for IRFs, the costs associated with teaching programs and treating low-income patients.

Estimating the Cost of 2013 PAC Stays

The analysis of the 2013 PAC stays included 8.9 million stays across the four settings. A stay is defined by a discharge in IRFs and LTCHs, an episode in HHAs, and days on Medicare-covered claims within a SNF stay. Claims covering each SNF stay were combined to create a stay.

Approximately 9 percent of home health episodes and 14 percent of institutional stays had missing data and were dropped (Table 3). Stays were dropped because of

- zero payments;
- missing data on charges;
- missing provider data, such as cost-to-charge ratios;
- missing data on the area wage index; and
- missing other data needed for the analysis (such as the data to calculate a level of severity of illness for a stay or an indicator of disability for the beneficiary).

We also dropped SNF stays of over 101 days, IRF and LTCH stays with a length of stay greater than 3 standard deviations above the mean of the logged distribution, and LTCH stays with multiple nonzero claims.

TABLE 3

Distribution of 2013 Stays across Settings

	Number of 2013 stays	Number of stays in PAC PPS Analysis	Percent of stays dropped
Home health agencies	6,695,952	6,108,960	8.7
Skilled nursing facilities	2,630,489	2,266,204	13.8
Inpatient rehabilitation facilities	440,584	378,163	14.2
Long-term care hospitals	159,596	136,665	14.4
Total	9,926,621	8,889,992	10.4

Source: 2013 Medicare Standard Analytic Files.

The stays included all conditions, reflecting the assumption that the PAC PPS would be used to pay for all stays regardless of the principal reason for treatment or the patients' comorbidities. The stays were from 9,188 HHAs (37 percent of PAC providers); 14,256 SNFs (57 percent of PAC providers);

1,093 IRFs (4 percent of PAC providers); and 416 LTCHs (2 percent of PAC providers). Overall, 11 percent of stays are with hospital-based providers.²

Costs per stay include routine and ancillary costs, overhead costs, and for IRFs, the costs associated with teaching programs and treating low-income patients.³ For institutional stays, we estimated therapy and NTA costs by converting charges on the PAC claims to costs using facility-specific and department-specific cost-to-charge ratios from each provider's Medicare cost report. To estimate therapy costs for HHAs, we calculated cost-to-charge ratios for each agency as the ratio of average charges per visit for the agency from the Datalink file and average costs per visit from the provider's Medicare cost report. We then converted the charges from the Datalink file to costs using this cost-to-charge ratio. All costs were standardized using the provider's wage index.

We did not have measures of routine relative resource use for the 2013 stays. Therefore, we imputed "actual" stay routine costs in three steps described in more detail below. First, we used the PAC-PRD data to develop a model to predict the routine resource use in a stay relative to the facility average routine resource use. Second, we applied this model to predict the relative routine resource use within facilities for the 2013 PAC stays. Third, we created routine costs for each stay by using the average facility costs from the cost report adjusted by the predicted relative routine use within facilities.

For the prediction model, we used the clinical, demographic, and stay measures included in our administrative models of costs as well as a quadratic function of length of stay (or, for HHA episodes, the number of visits) from the administrative data. We also included an indicator for each provider in the PAC-PRD data so that the coefficients on the clinical, demographic, and stay information describe how each patient's routine resource use deviates from that provider's average. The model is estimated using Poisson multivariate regression (generalized linear model with a log link). Coefficients are reported in the Appendix. This model provides the predictions of the routine resource use for each stay relative to the facility average routine resource use.

To calculate the routine cost for a stay, we calculated an average routine cost per stay for the provider of the stay by combining costs per day from the provider's 2013 Medicare cost report with lengths of stay from claims. We then used the model-predicted relative resource use for the stay relative to the average prediction of all stays for the provider to adjust the stay's routine cost up or

² Hospital-based facilities account for 10 percent of home-health stays, 6 percent of SNF stays, 51 percent of IRF stays, and no LTCH stays.

³ Because the overhead share of the total cost of a stay were similar across settings (though the levels differed), we did not model fixed and variable costs separately.

down relative to the facility average routine cost.⁴ This ensures that each facility's imputed routine cost is centered on the actual routine cost for that facility.

Predicting the Cost of Stays Using Patient Characteristics

Under a PAC PPS, the payment for the stay would be based on the stay's predicted cost. Characteristics such as the patient's diagnoses and comorbidities are used to predict the actual cost of the stay. We assessed the accuracy of the prediction models by comparing the predicted and actual costs for various patient groups. Because the objective of a PAC PPS is to establish a uniform payment for the same patient regardless of PAC setting, we focused our analysis on the accuracy of predicting costs for various patient groups rather than on predicting costs by setting.

We first developed a "full" model to predict the costs of stays using the unique data in CMS's PAC-PRD. These data provided information on patients' motor and cognitive function and routine resource use (predominantly nursing care). We also used claims information from PAC stays and the preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores, and cost report information for PAC providers. Information on diagnoses and the primary reason for treatment was collected from prior hospital stay claims and from PAC stay claims for patients admitted from the community. Comorbidities data were likewise collected from hospital stay claims and claims from PAC stays for patients admitted from the community. Indicators of ventilator care and severe wound care needs were obtained from the PAC stay claims.

We then developed a parallel "administrative" model to predict the costs of stays for the PAC-PRD sample without relying on the unique data obtained from the common assessment tool used in the PAC-PRD (Table 4). Wherever possible, the same variables that were used to predict the costs per stay in the administrative model with the PAC-PRD data were then included in the model predicting the costs of 2013 PAC stays, with the magnitude of the effects of each variable re-estimated based on the 2013 data.

⁴ An alternative approach could have estimated the average routine cost per day (readily available from the cost report) and then multiplied this by each stay's length of stay. However, we know that patient care costs vary more than by length of stay, which our chosen approach attempts to capture.

TABLE 4

Comparison of Data Used to Predict Costs per Stay in the “Full” and “Administrative” Models

Model feature	PAC-PRD stays using full model	PAC-PRD stays using administrative model	2013 PAC stays using administrative model
Predictors of costs			
Age	Yes	Yes	Yes
Diagnoses and comorbidities	Yes	Yes	Yes
Patient severity	Yes	Yes	Yes
Impairments and treatments	Yes	Some proxies	Some proxies
Functional status	Yes	No	No
Cognitive status	Yes	Proxies	Proxies
Routine (nursing) resource use	Yes	Yes	Estimated
Number of PAC stays	6,409	6,409	8.9 million
Number of providers	107	107	24,953

Source: Urban Institute analysis of PAC-PRD stays and 2013 PAC stays for MedPAC.

Note: PAC = postacute care; PRD = Payment Reform Demonstration. The full model was based on unique patient assessment information and routine resource-use data collected during CMS’s PAC-PRD as well as readily available administrative data, such as claims information from PAC stays and the preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores from the Medicare Advantage risk score files, and cost report information for PAC providers. The administrative model was based only on administrative data. Both models combine the results of a model that predicts the costs of routine and therapy combined and one that predicts nontherapy ancillary costs.

The “full” and “administrative” approaches use two models to predict each stay’s actual costs (one model for routine and therapy costs and another for NTA costs) using patient and stay characteristics. We combined the cost estimates generated by the models and evaluated the results by comparing total actual costs (including zero NTA costs for HHA stays) to the total predicted costs (including zero predicted NTA costs for HHA stays). Under a PAC PPS, relative weights for each stay would be based on the total of the predicted costs generated by the two models.

We used the following information to predict the cost of stays:

- patient age and disability status
- primary reason to treat (using Medicare Severity-Diagnosis Related Groups from the hospital claim when there was a preceding hospital stay, simulated from PAC claims for stays without a preceding hospitalization were aggregated into the broad “reason to treat” groups included in the PAC-PRD)
- patient comorbidities (from the hospital claim when there was a preceding hospital stay, simulated from PAC claims’ diagnostic information for stays without a preceding hospitalization)

- the number of body systems involved with the patient's comorbidities (from the hospital claim when there was a preceding hospital stay, simulated from PAC claims' diagnostic information for stays without a preceding hospitalization)
- days spent in the intensive and coronary care units during the previous hospital stay
- the patient's severity of illness (using the All Patient Refined Diagnosis Related Groups based on the diagnostic information from the immediately preceding hospital stay, or simulated based on PAC claims' diagnostic information for patients admitted directly from the community)
- beneficiary's risk score
- impairments and treatments (including bowel incontinence, severe wounds or pressure ulcers, use of certain high-cost service items, and difficulty swallowing)
- patient's functional status
- patient's cognitive status

The full and administrative models include the same factors except where data are not available in administrative data—functional assessment information and indicators of certain high-cost care items (complex wound care management, specialty surface or bed, and cardiac monitoring). To compensate for the lack of functional status information in the administrative models, we calculated a JEN Frailty Index for each stay and included the components of that index as predictors.⁵

The definitions of some factors differ between the full and administrative models because we substituted claims-based proxies for PAC-PRD data where approximations could be made. Specifically, the PAC-PRD data include a variable indicating the patient was on a ventilator, had bowel incontinence, had severe wound care needs, or received complex care management; for the administrative models, we relied on codes from the International Classification of Diseases, 9th Revision (ICD-9) in the PAC claims to indicate bowel incontinence and the presence of ventilator care (and we excluded the complex care management variable).⁶ The PAC-PRD data include measures of cognitive function; for the administrative models, we used ICD-9 codes for coma, dementia, Alzheimer's disease, schizophrenia, and depressive disorders as proxies for this dimension. The PAC PRD data include information on a patient's difficulty swallowing; in the administrative models, we used ICD-9 codes for dysphagia as a

⁵ The JEN Frailty Index is an algorithm developed by JEN Associates, Inc., to identify frail older adults who may be at risk of institutionalization. It is based on 13 grouped categories of diseases or signs found to be significantly related to concurrent or future need for long-term care services. The algorithm uses diagnoses codes from claims. The index is intended to supplement the administrative model where functional status information is not available.

⁶ Severe wound care includes patients with a nonhealing surgical wound, an infected wound, a wound for a patient who is morbidly obese, a fistula, osteomyelitis, or with a stage III, stage IV, or an unstageable pressure wound.

proxy for swallowing difficulties. More detailed definitions of the predictors for the full and administrative models are reported in Table 5 (see page 22) All tables referenced from this point forward appear at the end of the report, preceding the Appendix.

We avoided including in the model indicators of service use that might be manipulated by providers (such as the amount of rehabilitation therapy, the number of therapy disciplines, or the use of oxygen without a link to a respiratory diagnoses), but we did include indicators for ventilator care, tracheostomy care, and continuous positive airflow pressure because the cost of those services is significant and use is much less likely to be influenced by payment policy.

We include in the model an indicator of the care being provided by HHAs. In early models that did not include this measure, the predicted average of routine plus therapy costs for home health cases was around 48 percent above the average costs. The predicted cost for home health cases reflects the costs for comparable patients treated in institutional settings. HHAs do not incur the same kinds or levels of costs of institutional providers, so we include an indicator in the model for home health. Inclusion of this indicator imposes that costs for home health cases are predicted correctly on average.

Costs were predicted using Poisson regression models. Compared with ordinary least squares regression, the Poisson regression gives less emphasis to infrequent but exceptionally high-cost stays. In addition, Poisson models can more easily handle dependent variables with 0 values (such as stays with no NTA or therapy costs).

Comparing Payments and Costs

To compare the estimated payments generated by our PAC PPS models with the actual costs and actual payments of stays, 2013 actual payments were standardized by each provider's area wage index. Thus, actual payments and costs adjust for differences in input costs across geographic areas. Because estimated payments are based on costs that were already standardized, estimated payments did not need to be adjusted. Model-based payments are adjusted to be budget neutral so that the total dollars paid out with model-based payments equal total actual payments in 2013. Payments include any relevant adjustments for rural location, teaching, low-income share, outliers, and the amounts paid by the beneficiary (any coinsurance and deductibles).

In addition to modeling the payment effects of a unified set of payments, we model the effects of adding two illustrative outlier policies. First, we model a system in which 5 percent of payments are set aside for high-cost outlier payments. The system reimburses 80 percent of losses above the fixed loss amount, defined to be \$1,829 for HHAs and \$10,016 for institutional settings. With this policy, roughly 11 percent of home health episodes and 11 percent of institutional stays would receive an outlier payment.

Second, we separately model a short-stay outlier payment. For this illustrative policy, institutional stays with lengths of stay within the shortest decile for their institutional settings are paid at 1.2 times the per diem cost for the first day and at cost for subsequent days. Home health low-utilization payment adjustment cases with four or fewer visits are paid at 1.2 times the per visit cost for the first visit and paid at cost for subsequent visits.

Evaluating the Design of the PAC PPS

To evaluate the potential accuracy of a PAC PPS and estimate its impact on payments, we examined the accuracy of the models in aggregate (across all stays) and their effects on many patient groups. Stays from the four settings were assigned to one or more groups based on the stays' characteristics. (We created these groups to report the results of the PPS design, but the underlying prediction models remain the same across all groups.) These groups "stress test" the models by looking at how well they perform for different clinical conditions and various definitions of medically complex patients. The groups are detailed throughout the following subsections.⁷

CLINICAL CONDITION

Twenty of the 22 clinical conditions we examined were based on information (diagnoses and procedure codes) from claims for the preceding hospital stay and, where there was no prior acute hospital stay within 30 days, from claims for the PAC stay. Two clinical conditions, ventilator care and severe wound care, were based on information from the PAC claim. For stays without a prior hospital stay, the Medicare Severity-Diagnosis-Related Group assignment was simulated using diagnostic information from the PAC claim. Except for stays for patients with serious mental illness, the clinical condition groups are mutually exclusive, with stays first assigned to ventilator care, then severe wound care; all other stays are assigned to a major diagnosis category (MDC) based on the Medicare Severity-Diagnosis Related Group. We report on the following clinical conditions:

- Ventilator care
- Severe wound care
- Stroke
- Other neurology medical—medical stays assigned to MDC 1, excluding stroke

⁷ The groups used differ somewhat for the PAC-PRD and 2013 analyses. For both the full and administrative model analyses using the PAC-PRD data, we use data from the common assessment instrument to define cognition, functioning, and PAC services, such as the use of a ventilator. We exclude groupings by provider characteristics because of the small size of the PAC-PRD provider sample. For the analysis of the 2013 administrative data, we define the groups to the extent possible based on administrative data and exclude the groups indicating functional status.

- Other neurology surgical—surgical stays assigned to MDC 1, excluding stroke
- Orthopedic medical—medical stays assigned to MDC 8
- Orthopedic surgical—surgical stays assigned to MDC 8
- Respiratory medical—medical stays assigned to MDC 4
- Respiratory surgical—surgical stays assigned to MDC 4
- Cardiovascular medical—medical stays assigned to MDC 5
- Cardiovascular surgical—surgical stays assigned to MDC 5
- Infection medical—medical stays assigned to MDC 18
- Infection surgical—surgical stays assigned to MDC 18
- Hematology medical—medical stays assigned to MDC 16 or 17
- Hematology surgical—surgical stays assigned to MDC 16 or 17
- Rehabilitation medical—medical stays assigned DRGs 945 or 946
- Skin medical—medical stays assigned to MDC 9
- Skin surgical—surgical stays assigned to MDC 9
- Serious mental illness—includes stays for beneficiaries with schizophrenia, bipolar disorder, or severe depression, identified using the hierarchical condition code indicators 57 or 58. This group is not mutually exclusive with the other clinical groups—a stay can be assigned to another clinical group and to the serious mental illness group.
- Other medical—medical stays not otherwise grouped (including liver, gastrointestinal, or endocrine)
- Other surgical—surgical stays not otherwise grouped (including liver, gastrointestinal, or endocrine)
- Other (not otherwise grouped)

MEDICALLY COMPLEX

We examined four different definitions of medical complexity. The definitions (and the stays included in each) overlap to some degree.⁸

- Severity-of-illness level 4 (the highest level)—stays for patients assigned to the highest severity group (group 4, indicating extreme severity) using the All Patient Refined Diagnosis Related Groups based on the diagnostic information from the immediately preceding hospital stay (or simulated for patients admitted directly from the community). About 4 percent of stays are included in this group.
- Highest acuity patients—stays for patients categorized as severity-of-illness level 4 during the prior hospital stay who were not treated in HHAs (they were too sick to be discharged home) and were also on dialysis and had severe wounds. This group identifies a subset of outlier stays and makes up about 0.003 percent of all stays.
- Multiple body systems—stays in institutional PAC settings for patients with diagnoses involving five or more body systems. About 5 percent of stays are included in this group.
- Chronically critically ill—stays for patients who spent eight or more days in the intensive care or coronary care unit during the preceding hospital stay or were on a ventilator in the PAC setting. About 5 percent of stays are included in this group.

PATIENT IMPAIRMENT AND FUNCTIONAL STATUS

We looked at three aspects of patient frailty and functional status.

- Impaired cognition—for the PAC-PRD stays, we defined these as patients assessed as moderately or severely impaired; for the 2013 stays, we defined these as patients who were in a coma or had dementia or Alzheimer’s disease.
- High and low function—for the PAC-PRD stays, we assigned stays to high and low function groups using Rasch motor scores (a combination of mobility and self-care) at admission to the PAC setting. High and low function were defined as the top (highest functioning) and bottom (lowest functioning) quartiles of the distribution of Rasch scores. This information was not available for 2013 PAC stays; therefore, results for these groups were not reported.
- Patient frailty—we used the JEN Frailty Index to assign stays to the top (most frail) and bottom (least frail) quartiles of the distribution of the frailty scores.

⁸ Across institutional PAC stays, three-quarters of stays did not qualify for any definition of medically complex. Of those that did, about 40 percent qualified for more than one definition. Across HHA stays, most stays (96 percent) did not qualify for either definition of medically complex that included HHA stays (severity of illness level 4 and chronically critically ill). Of the small share of HHA stays that did, most qualified for only one of the definitions; 21 percent qualified for both definitions.

OTHER STAY AND PATIENT CHARACTERISTICS

We also examined the following patient groups:

- Low and high therapy—for institutional PAC stays, the groups include stays with the lowest (bottom quartile) and highest (top quartile) therapy costs as a share of total stay costs. For home health stays, the low group includes the 40 percent of HHA stays with no therapy costs.
- Short stays—for institutional stays, patients with stays in the shortest decile for their setting. For home health stays, the low utilization payment adjustment indicates episodes with four or fewer visits.
- Community admissions—patients admitted from the community (patients with no hospital stay within the 30 days preceding the PAC stay, identified by the lack of a matching hospital claim).
- Patients with a prior hospitalization within the 30 days preceding the PAC stay identified by a matching hospital claim
- Disabled
- Dually eligible for Medicare and Medicaid
- Beneficiaries with end-stage renal disease
- Very old (age 85 or older)

PROVIDER CHARACTERISTICS

In the 2013 administrative data, we also examine payment accuracy by provider characteristics, including hospital-based/freestanding facilities; frontier, metro, rural micropolitan, rural adjacent, rural nonadjacent, urban core-based statistical area–based, and rural core-based statistical area–based facilities; low-income share for IRFs; IRF teaching facilities; and nonprofit, for-profit, and government facilities.⁹ In addition, we report the region where the provider is located:

- Region 1: CT, ME, MA, NH, RI, VT
- Region 2: NY, NJ
- Region 3: MD, DC, DE, WV, VA, PA
- Region 4: NC, SC, TN, FL, GA, AL, KY, MS
- Region 5: MI, MN, OH, IL, IN, WI
- Region 6: TX, LA, AR, OK, NM

⁹ These are not reported for the PAC-PRD data because of the small number of providers in this sample.

- Region 7: MO, KS, IA, NE
- Region 8: MD, UT, SD, WY, CO, MT
- Region 9: NV, AZ, CA, HI
- Region 10: WA, AK, ID, OR

Findings Based on the PAC-PRD Sample

We report the model coefficients based on the PAC-PRD full model specification in Table 6 and the coefficients based on the PAC-PRD administrative model specification in Table 7. Separate models are reported for routine plus therapy costs and for NTA costs. The routine plus therapy models are based on stays from institutional and home health settings; the model of NTA costs is based on stays from the institutional settings. The prediction for each institutional stay is the sum of the predicted costs from the routine plus therapy and NTA models; the prediction for home health episodes is the predicted cost from the routine plus therapy model. Each model was weighted to reflect the distribution of stays across settings (Table 2).

The full model has only modestly higher predictive power than the model based on administrative data (Tables 8 and 9). The column labeled “model R-squared” shows the share of variance in costs explained by the model overall (in the row labeled “all” and by setting). The full model explains 60 percent of the variance in costs across all settings compared with the administrative model’s 57 percent.

We also report the “setting R-squared”, which is the percentage of variation that is explained allowing separate models for each setting. As expected, an overall model is less able to predict the cost of stays compared with setting-specific models, particularly for IRFs and LTCHs, which receive relatively little weight in the overall model.

A comparison of setting R-squared statistics of the full and administrative models indicates that the gain in predictive ability from using detailed assessment data is not huge. Differences in setting R-squared across models with the same outcomes and different predictors indicate the extent to which one set of predictors are more effective in describing variation in costs across patients within a single setting. In HHAs, SNFs, and IRFs, the full model explains between 3 and 6 percentage points more of the variance in costs than the administrative model. In LTCHs, the full model explains a somewhat smaller share of the variance than the full model.

Additional details of the predictive ability of the full and administrative models based on the PAC-PRD data, along with the distribution of each group across the postacute settings, are reported in the

remaining rows of Tables 8 and 9. For most groups, the ratio of predicted to actual costs is close to one. In almost all cases, the ratios of predicted to actual costs are similar using the full and administrative models. For groups that rely on variables that are not well measured in the administrative data, the ratios for the full and administrative models are similarly above or below one. The largest differences are observed for functional status, which show ratios of predicted to actual costs that are farther from one when the model is based on administrative data.

Findings Based on the 2013 Sample

The model coefficients from the 2013 data are reported in Table 10. As in the PAC-PRD data, the routine plus therapy models are based on all four postacute settings; the model of NTA costs is based only on stays from the institutional settings. The models are unweighted because the analysis is already nationally representative.

In Table 11, we report average actual costs, predicted costs, actual payments, and payments under a PAC PPS for PAC stays in 2013. Analysis shows that a stay-based PAC PPS based on patient characteristics could establish accurate relative costs of stays in aggregate and across most of the patient groups we examined. Because payments would be based on patient characteristics and not the amount of therapy care, the PAC PPS would raise payments for medically complex stays and lower payments for rehabilitation stays compared with current (2013) payments. Compared with current policy, payments would be more uniformly related to the costs of stays across the patient groups, so providers would have less incentive to selectively admit certain types of patients over others. For patient groups with predicted costs that were substantially different from actual costs, current practices (such as the provision of therapy unrelated to patient characteristics) or cost structures of high-cost settings explained these results.

Parallel results for an illustrative outlier policy are reported in Table 12. Results for a short-stay outlier policy are reported for short stays in Table 13. We found that a high-cost outlier policy would increase payments for stays with ventilator care and severe wound care as well as for the four medically complex groups. Because payments would increase for these types of stays, providers may have less financial incentive to avoid these patients. A short-stay policy would more closely align payments with the considerably lower costs of short stays.

Conclusion

In this memo we have provided additional methodological detail and data analyses that are used in the MedPAC report to Congress on a unified payment system for postacute care. The implications of these

findings for the design of a unified payment system, as well as likely impacts of moving from the current setting-specific prospective payment system to a unified payment system, are discussed in the MedPAC report.

TABLE 5

Description and Source of Predictors for Full and Administrative Models

Characteristic	Full Model Predictors		Administrative Model Predictors	
	Predictors	Source	Predictors	Source
Age	Three predictors: Age - 50, (Age - minus 50) ² , and age less than 50	PAC-PRD assessment	Three predictors: Age - 50, (Age - minus 50) ² , and age less than 50	HCC risk score file
Cognitive function	Coma, communication disorder, cognition moderately impaired, severe or missing impairment	PAC-PRD assessment	Dementia, Alzheimer's, schizophrenia, major depressive disorder, bipolar disorder, paranoid disorder	Based on diagnoses from prior hospital stay and current PAC stay
Ability to function	Rasch mobility score, Rasch selfcare, Rasch moter squared, ability to sit	PAC-PRD assessment	Ability to function (components of JEN Frailty Index include: minor ambulatory limitations, severe ambulatory limitations, cognitive development disability, chronic mental illness, dementia, sensory disorders, selfcare impairment, sycope, cancer, chronic medical disease, pneumonia, renal disorders, systemic disorders (e.g. septicemia)	Based on diagnoses from prior hospital stay and current PAC stay
Primary reason for treatment	MS-DRGs were assigned to broad categories (see note)	From prior hospital stay MSDRG if available; imputed MSDRG for PAC stay if no stay found. Excludes vent cases because these are assigned to the ventilator group.	MS-DRGs were assigned to broad categories (see note)	From prior hospital stay MSDRG if available; imputed MSDRG for PAC stay if no stay found. Excludes vent cases because these are assigned to the ventilator group.
Ventilator care	Patient was on a ventilator during PAC stay	PAC-PRD assessment	Patient was on a ventilator during PAC stay	PAC diagnosis
Patient comorbidities	Comorbidities	From prior hospital stay if available; from PAC stay if not none	Comorbidities	From prior hospital stay if available; from PAC stay if not none
Treatments and impairments	Indicators of bowel incontinence, complex wound management, cardiac monitoring, specialty surface or bed, continuous positive airflow pressure (CPAP), and difficulty swallowing	PAC-PRD assessment	Indicators of bowel incontinence, continuous positive airflow pressure (CPAP), and difficulty swallowing	PAC diagnoses
Risk score	Risk score	CMS-HCC risk score	Risk score	CMS-HCC risk score
Total number of ICU and CCU days	Total number of ICU and CCU days (capped at 22)	From prior hospital stay claim	Total number of ICU and CCU days (capped at 22)	From prior hospital stay claim

Characteristic	Full Model Predictors		Administrative Model Predictors	
	Predictors	Source	Predictors	Source
Severity level	APR-DRG Severity Level 1-4	Stay assigned to APR-DRG Severity of Illness Level 1-4 using claim from prior hospital stay (or imputed if no prior hospital stay within 30 days was found)	APR-DRG Severity Level 1-4	Stay assigned to APR-DRG Severity of Illness Level 1-4 using claim from prior hospital stay (or imputed if no prior hospital stay within 30 days was found)
Severe wound	Indicators for non-healing surgical wound, an infected wound, a wound for a patient who is morbidly obese, a fistula, osteomyelitis, or with a stage III, stage IV, or an unstageable pressure wound.	PAC diagnoses	Includes non-healing surgical wound, an infected wound, a wound for a patient who is morbidly obese, a fistula, osteomyelitis, or with a stage III, stage IV, or an unstageable pressure wound.	PAC diagnoses
Number body systems >= 5	Diagnoses includes 5 or more body systems	Count of # comorbidities from prior hospital stay, if any; from PAC stay if none	Diagnoses includes 5 or more body systems	Count of # comorbidities from prior hospital stay, if any; from PAC stay if none
Disabled	Original reason for entitlement is disabled	Medicare enrollment file	Original reason for entitlement is disabled	Medicare enrollment file
Home health agency patient	Patient treated in a home health agency	Home health claim	Patient treated in a home health agency	Home health claim
Additional predictors for administrative model for predicting routine costs				
Number of visits (home health stays)		# visits if hha; else 0	Home health claim	
Number of visits squared (home health stays)		# visits squared if hha; else 0	Home health claim	
Length of stay (institutional PAC stays)		Length of stay if institutional; else 0	PAC claims	
Length of stay squared (institutional PAC stays)		Length of stay squared if institutional; else 0	PAC claims	

Note: Broad groups for primary reason for treatment are stroke, neurological surgical, neurological medical, Respiratory with tracheostomy or ventilator care, respiratory surgical, respiratory medical, COPD, cardiovascular vascular surgical, cardiovascular cardiac surgical, cardiovascular medical, orthopedic minor surgical, orthopedic spinal, orthopedic minor medical, orthopedic major medical, skin surgical, skin medical, endocrine surgical, endocrine medical, kidney and urinary surgical, kidney and urinary medical, infections surgical, infections medical, infections septicemia, transplant, gastrointestinal and liver minor surgical, gastrointestinal & liver major surgical, gastrointestinal and liver minor medical, gastrointestinal and liver major medical, hematology surgical, hematology medical, other surgery, other medical, no group. Comorbidity groups are alcohol or drug disease, cancer, cardiac and vascular, complications of device or graft, dementia, eye disorders, gastrointestinal and liver, head and spine, hematologic and immunologic disease, HIV/AIDS, mental illness, metabolic endocrine, neurological excluding stroke, obesity, orthopedic, renal, respirator dependence, respiratory, septicemia and other systemic infection, skin disorders, stroke, transplant.

TABLE 6

Full Models of Costs per Stay: PAC-PRD Data

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Age minus fifty (capped at 45)								
Age - 50	0.009	0.0060	1.43	1.009	0.024	0.0129	1.84	1.024
Age -50 squared	-0.00013	0.0001	-1.19	0.9999	-0.00068	0.0002	-2.96	0.9993
Age less than 50	0.023	0.0932	0.25	1.02	0.137	0.1815	0.75	1.146
Cognitive function								
Coma	-0.084	0.0853	-0.98	0.92	0.033	0.1046	0.32	1.034
Communication disorder	0.055	0.0636	0.87	1.06	0.064	0.1120	0.57	1.066
Cognition: Moderately impaired	0.035	0.0305	1.14	1.04	-0.044	0.0545	-0.80	0.957
Cognition: Severe impairment or missing	-0.058	0.0442	-1.32	0.94	-0.005	0.0920	-0.06	0.995
Ability to function								
Rasch mobility score	-0.004	0.0015	-2.65	1.00	-0.008	0.0054	-1.56	0.992
Rasch selfcare score	-0.005	0.0027	-1.68	1.00	0.004	0.0091	0.39	1.004
Rasch motor squared	0.000	0.0000	-1.26	1.00	0.000	0.0001	0.29	1.000
Can sit with support	0.147	0.0314	4.67	1.16	0.223	0.0662	3.37	1.250
Can not sit or not assessed due to medical restriction	0.232	0.0655	3.54	1.26	0.516	0.1246	4.14	1.676
Primary reason for treatment^a								
Stroke	0.298	0.0721	4.14	1.35	0.026	0.1299	0.20	1.026
Neurological surgical	0.329	0.1362	2.42	1.39	0.563	0.1587	3.54	1.755
Neurological medical	0.214	0.0682	3.14	1.24	0.079	0.1563	0.51	1.083
Respiratory with tracheostomy or ventilator	0.382	0.1182	3.23	1.47	0.523	0.1741	3.01	1.687
Respiratory surgical	0.004	0.1475	0.03	1.00	-0.002	0.3134	-0.01	0.998
Respiratory medical	0.156	0.0755	2.07	1.17	0.356	0.1291	2.76	1.428
Chronic obstructive pulmonary disease	0.080	0.0980	0.82	1.08	0.550	0.1842	2.99	1.734
Cardiovascular vascular surgical	0.304	0.1412	2.15	1.36	0.643	0.2842	2.26	1.903
Cardiovascular cardiac surgical	-0.123	0.0857	-1.44	0.88	-0.270	0.1873	-1.44	0.763
Cardiovascular general medical	0.080	0.0696	1.14	1.08	0.024	0.1079	0.22	1.024
Orthopedic minor surgical	0.321	0.0714	4.50	1.38	0.340	0.1119	3.03	1.404
Orthopedic spinal	0.023	0.0740	0.31	1.02	-0.028	0.1220	-0.23	0.972
Orthopedic minor medical	0.126	0.0620	2.04	1.13	0.034	0.0851	0.40	1.035
Orthopedic major medical	0.383	0.1086	3.52	1.47	0.391	0.2428	1.61	1.478
Skin surgical	0.339	0.1561	2.17	1.40	0.854	0.1939	4.41	2.349
Skin medical	0.163	0.0937	1.74	1.18	0.123	0.1724	0.71	1.131
Endocrine surgical	0.373	0.2093	1.78	1.45	0.438	0.2200	1.99	1.550
Endocrine medical	0.208	0.0732	2.85	1.23	-0.115	0.1841	-0.63	0.891
Kidney & urinary surgical	-0.084	0.1803	-0.47	0.92	-0.488	0.4096	-1.19	0.614
Kidney & urinary medical	0.068	0.0915	0.75	1.07	0.140	0.1903	0.73	1.150
Infections surgical	0.246	0.0966	2.55	1.28	0.420	0.1799	2.34	1.523

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Infections medical	0.116	0.2800	0.42	1.12	0.006	0.3605	0.02	1.006
Infections septicemia	0.079	0.1162	0.68	1.08	0.110	0.1939	0.57	1.116
Transplant	0.316	0.1264	2.50	1.37	0.144	0.5720	0.25	1.155
GI & liver minor surgical	-0.132	0.1157	-1.14	0.88	-0.299	0.2389	-1.25	0.741
GI & liver major surgical	0.166	0.1278	1.30	1.18	0.253	0.2312	1.10	1.288
GI & liver minor medical	0.081	0.0899	0.90	1.08	0.431	0.3147	1.37	1.538
GI & liver major medical	-0.016	0.1256	-0.13	0.98	-0.229	0.2295	-1.00	0.796
Hematology surgical	0.137	0.3026	0.45	1.15	0.147	0.2532	0.58	1.159
Hematology medical	0.095	0.1582	0.60	1.10	0.660	0.2107	3.13	1.934
Other surgery	-0.062	0.0911	-0.69	0.94	0.329	0.3123	1.05	1.390
Other medical	0.134	0.0908	1.48	1.14	0.361	0.2660	1.36	1.435
Other (not otherwise grouped)	-0.074	0.1229	-0.60	0.93	0.545	0.2646	2.06	1.724
Ventilator (PAC-PRD measure)	0.326	0.1266	2.58	1.39	0.427	0.1614	2.65	1.533
Comorbidities								
Alcohol or drug disease	0.046	0.0815	0.57	1.05	0.329	0.1900	1.73	1.390
Cancer	0.047	0.0580	0.82	1.05	0.323	0.1464	2.20	1.381
Cardiac and Vascular	0.006	0.0327	0.18	1.01	0.107	0.0588	1.82	1.113
Complications of device or graft	0.071	0.1435	0.49	1.07	0.242	0.1291	1.88	1.274
Dementia	0.047	0.0423	1.12	1.05	-0.056	0.0748	-0.75	0.946
Eye disorders	-0.486	0.0813	-5.98	0.61				
GI and liver	0.058	0.0526	1.11	1.06	0.194	0.0884	2.19	1.214
Head and spine	0.107	0.0466	2.29	1.11	0.070	0.0927	0.75	1.072
Hematologic + immunologic disease	0.055	0.0757	0.73	1.06	0.069	0.1226	0.56	1.072
HIV/AIDS	-0.129	0.3140	-0.41	0.88	-0.027	0.3507	-0.08	0.973
Mental illness	0.204	0.0942	2.16	1.23	0.295	0.1251	2.36	1.343
Metabolic endocrine	0.076	0.0306	2.50	1.08	0.125	0.0571	2.20	1.134
Neuro excluding stroke	0.044	0.0437	1.00	1.04	0.055	0.0790	0.70	1.057
Obesity	-0.007	0.0774	-0.10	0.99	0.188	0.1289	1.46	1.207
Orthopedic	0.110	0.0544	2.02	1.12	0.178	0.0965	1.84	1.195
Renal	0.030	0.0260	1.14	1.03	0.126	0.0570	2.21	1.134
Respirator dependence	-0.007	0.0967	-0.07	0.99	0.045	0.1135	0.40	1.046
Respiratory	0.000	0.0330	0.01	1.00	0.104	0.0618	1.69	1.110
Septicemia + other systemic infection	0.050	0.0589	0.85	1.05	-0.097	0.0772	-1.25	0.908
Skin disorders	0.127	0.0472	2.70	1.14	-0.051	0.0912	-0.56	0.950
Stroke	0.266	0.0498	5.34	1.30	0.099	0.0872	1.14	1.104
Transplant	0.013	0.1246	0.10	1.01	0.354	0.1996	1.78	1.425
Treatments and impairments								
Bowel incontinence	-0.052	0.0450	-1.15	0.95	0.071	0.0804	0.88	1.073
Complex wound management	0.246	0.1085	2.27	1.28	0.567	0.1535	3.70	1.763
Cardiac monitoring	0.367	0.1188	3.09	1.44	0.661	0.1432	4.62	1.938
Specialty surface or bed	0.137	0.0818	1.68	1.15	0.365	0.1075	3.40	1.441
CPAP	-0.079	0.1915	-0.41	0.92	0.127	0.2354	0.54	1.136
Swallowing	0.067	0.0474	1.41	1.07	0.096	0.1047	0.91	1.100
Risk score	0.007	0.0088	0.81	1.01	0.052	0.0179	2.94	1.054

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Total number of ICU and CCU days (capped)	0.007	0.0033	2.00	1.01	0.020	0.0061	3.20	1.020
Severity level								
Zero	0.038	0.1134	0.33	1.04				
Two	0.053	0.0322	1.65	1.05	0.188	0.0654	2.87	1.207
Three	0.055	0.0454	1.21	1.06	0.305	0.0899	3.40	1.357
Four	0.068	0.0600	1.13	1.07	0.395	0.1038	3.81	1.484
Wound care								
Pressure ulcer, stage III, IV or unstageable	0.055	0.1130	0.49	1.06	0.181	0.1346	1.35	1.198
Osteomyelitis	0.008	0.0913	0.09	1.01	0.269	0.1613	1.67	1.309
Fistula	0.657	0.2015	3.26	1.93	0.955	0.2871	3.33	2.598
Infected wound	0.174	0.0870	2.00	1.19	0.485	0.1195	4.06	1.624
Nursing home surgical wound	0.343	0.1011	3.39	1.41	0.582	0.1555	3.74	1.789
Number of body systems ≥ 5	0.077	0.0945	0.82	1.08	-0.112	0.1248	-0.90	0.894
Disabled	0.016	0.0370	0.44	1.02	0.097	0.0808	1.2	1.102
Home health agency patient	-1.202	0.0671	-17.92	0.30				
Constant	9.003	0.1311	68.66	8127.77	6.530	0.2852	22.9	685.228
N	6,409				2,542			

Notes: The Poisson regression was weighted by setting. Standard errors are clustered by provider.

^aOrthopedic major surgery is the omitted group.

TABLE 7

Administrative Models of Costs per Stay: PAC-PRD Data

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Age minus fifty (capped at 45)								
Age - 50	0.007	0.0057	1.23	1.0071	0.0212	0.0134	1.58	1.021
Age -50 squared	-0.00009	0.0001	-0.80	0.9999	-0.00067	0.0002	-2.93	0.9993
Age less than 50	0.010	0.0962	0.10	1.010	0.161	0.2036	0.79	1.175
Cognitive function								
Coma	0.150	0.1362	1.10	1.162	0.294	0.3438	0.85	1.341
Dementia with complications (HCC51)	0.016	0.0852	0.19	1.016	-0.035	0.1321	-0.27	0.965
Dementia without complications (HCC52)	0.020	0.1199	0.16	1.020	0.119	0.1601	0.74	1.126
Schizophrenia (HCC57)	0.121	0.1969	0.61	1.128	0.008	0.2267	0.03	1.008
Major Depressive, Bipolar, and Paranoid Disorders (HCC58)	-0.122	0.1356	-0.90	0.885	-0.040	0.2620	-0.15	0.961
Ability to function (JFI index components)								
Minor ambulatory limitations	0.031	0.0484	0.65	1.032	0.136	0.1095	1.24	1.146
Severe ambulatory limitations	0.177	0.0365	4.86	1.194	0.204	0.0681	3.00	1.227
Cognitive developmental disability	0.039	0.0318	1.22	1.040	-0.010	0.0695	-0.15	0.990
Chronic mental illness	0.400	0.2084	1.92	1.491	-0.196	0.1893	-1.03	0.822
Dementia	-0.044	0.1099	-0.40	0.957	-0.073	0.1560	-0.47	0.929
Sensory disorders	0.154	0.0691	2.23	1.167	0.224	0.1405	1.60	1.251
Selfcare impairment	0.025	0.0222	1.11	1.025	0.136	0.0428	3.19	1.146
Syncope	0.029	0.0280	1.02	1.029	-0.172	0.0754	-2.28	0.842
Cancer	-0.113	0.0808	-1.40	0.893	-0.050	0.1301	-0.38	0.952
Chronic medical disease	-0.003	0.0324	-0.10	0.997	0.080	0.0680	1.18	1.083
Pneumonia	-0.055	0.0390	-1.42	0.946	0.073	0.0629	1.16	1.076
Renal disorders	0.043	0.0800	0.54	1.044	0.254	0.0887	2.87	1.290
Systemic disorders (e.g., septicemia)	0.106	0.0311	3.40	1.112	0.134	0.0725	1.85	1.143
Primary reason for treatment^a								
Stroke	0.216	0.0695	3.11	1.242	0.042	0.1258	0.34	1.043
Neurological surgical	0.271	0.1360	1.99	1.311	0.451	0.1783	2.53	1.570
Neurological medical	0.207	0.0668	3.11	1.230	-0.019	0.1729	-0.11	0.982
Respiratory trach/vent	0.606	0.1213	5.00	1.834	0.858	0.1979	4.33	2.358
Respiratory surgical	0.068	0.1462	0.46	1.070	0.009	0.3248	0.03	1.009
Respiratory medical	0.219	0.0791	2.77	1.245	0.365	0.1610	2.26	1.440
COPD	0.164	0.0888	1.84	1.178	0.621	0.1802	3.44	1.860
Cardiovascular vascular surgical	0.243	0.1332	1.82	1.275	0.590	0.2853	2.07	1.803
Cardiovascular cardiac surgical	-0.125	0.0854	-1.47	0.882	-0.239	0.1690	-1.41	0.788
Cardiovascular general medical	0.108	0.0749	1.44	1.114	0.130	0.1251	1.04	1.139
Orthopedic minor surgical	0.298	0.0686	4.35	1.348	0.340	0.1161	2.93	1.406

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Orthopedic spinal	0.078	0.0795	0.99	1.082	-0.049	0.1415	-0.35	0.952
Orthopedic minor medical	0.192	0.0627	3.06	1.211	0.097	0.1000	0.97	1.102
Orthopedic major medical	0.379	0.1052	3.60	1.461	0.354	0.1936	1.83	1.425
Skin surgical	0.421	0.1886	2.23	1.524	1.071	0.1996	5.37	2.919
Skin medical	0.179	0.0984	1.82	1.196	0.138	0.1915	0.72	1.148
Endocrine surgical	0.320	0.2060	1.56	1.378	0.476	0.2358	2.02	1.610
Endocrine medical	0.210	0.0844	2.48	1.233	-0.144	0.2144	-0.67	0.866
Kidney & urinary surgical	0.017	0.1688	0.10	1.017	-0.306	0.4245	-0.72	0.736
Kidney & urinary medical	0.077	0.1031	0.75	1.081	0.043	0.2063	0.21	1.044
Infections surgical	0.322	0.1125	2.86	1.380	0.611	0.1787	3.42	1.843
Infections medical	0.125	0.2488	0.50	1.133	0.148	0.3624	0.41	1.160
Infections septicemia	0.115	0.1284	0.90	1.122	0.101	0.2275	0.44	1.106
Transplant	0.369	0.1470	2.51	1.446	0.544	0.6603	0.82	1.723
GI & liver minor surgical	-0.091	0.1270	-0.72	0.913	-0.295	0.2490	-1.19	0.744
GI & liver major surgical	0.220	0.1297	1.70	1.246	0.252	0.2641	0.95	1.286
GI & liver minor medical	0.061	0.0954	0.64	1.063	0.430	0.3068	1.40	1.537
GI & liver major medical	0.024	0.1401	0.17	1.024	-0.119	0.2242	-0.53	0.887
Hematology surgical	0.196	0.2266	0.86	1.216	0.173	0.2659	0.65	1.189
Hematology medical	0.076	0.1798	0.42	1.079	0.703	0.3186	2.21	2.021
Other surgery	0.017	0.1121	0.15	1.017	0.505	0.2588	1.95	1.657
Other medical	0.157	0.0983	1.60	1.170	0.432	0.3206	1.35	1.540
Other (not otherwise grouped)	-0.132	0.1455	-0.91	0.877	0.346	0.3849	0.90	1.413
Ventilator	1.260	0.1287	9.79	3.526	1.865	0.1391	13.41	6.454
Comorbidities								
Alcohol or drug disease	0.004	0.0826	0.05	1.004	0.253	0.1933	1.31	1.287
Cancer	0.148	0.0839	1.76	1.159	0.379	0.1769	2.14	1.461
Cardiac and Vascular	0.015	0.0311	0.48	1.015	0.055	0.0635	0.86	1.056
Complications of device or graft	0.082	0.1328	0.62	1.085	0.202	0.1359	1.49	1.224
Dementia	0.101	0.0639	1.59	1.107	-0.023	0.1230	-0.19	0.977
Eye disorders	-0.716	0.0819	-8.74	0.489				
GI and liver	0.085	0.0590	1.44	1.089	0.237	0.1053	2.25	1.267
Head and spine	0.106	0.0535	1.98	1.112	0.084	0.0738	1.13	1.087
Hematologic + immunologic disease	0.004	0.0797	0.05	1.004	-0.037	0.1317	-0.28	0.964
HIV/AIDS	0.100	0.3169	0.32	1.105	0.097	0.4284	0.23	1.102
Mental illness	0.237	0.1645	1.44	1.268	0.404	0.2375	1.70	1.498
Metabolic endocrine	0.080	0.0276	2.90	1.083	0.102	0.0591	1.73	1.107
Neuro excluding stroke	0.045	0.0476	0.94	1.046	0.068	0.0960	0.71	1.070
Obesity	0.000	0.0882	0.00	1.000	0.172	0.1632	1.05	1.188
Orthopedic	0.116	0.0546	2.13	1.124	0.142	0.0982	1.44	1.152
Renal	-0.004	0.0773	-0.05	0.996	-0.082	0.0956	-0.86	0.921
Respirator dependence	-0.167	0.1267	-1.32	0.846	-0.130	0.1546	-0.84	0.878
Respiratory	0.012	0.0336	0.35	1.012	0.120	0.0581	2.07	1.128
Septicemia + Other systemic infection	0.064	0.0624	1.03	1.066	-0.047	0.0964	-0.49	0.954

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Skin disorders	0.217	0.0508	4.28	1.243	0.035	0.0903	0.38	1.035
Stroke	0.284	0.0544	5.21	1.328	0.129	0.0853	1.51	1.138
Transplant	-0.006	0.1148	-0.05	0.994	0.290	0.1984	1.46	1.336
Treatments and impairments								
Bowel incontinence	-0.092	0.1262	-0.73	0.912	-0.388	0.1518	-2.56	0.678
Continuous positive airflow pressure	0.467	0.1461	3.19	1.595	0.539	0.2112	2.55	1.715
Swallowing	0.177	0.0519	3.42	1.194	0.114	0.0935	1.22	1.120
Risk score	0.019	0.0090	2.11	1.019	0.063	0.0162	3.93	1.066
Total number of ICU and CCU days (capped)	0.008	0.0038	2.23	1.009	0.022	0.0056	3.85	1.022
Severity level								
Zero	-0.008	0.1389	-0.06	0.992				
Two	0.026	0.0289	0.89	1.026	0.147	0.0618	2.37	1.158
Three	0.063	0.0477	1.33	1.065	0.338	0.1024	3.30	1.402
Four	0.061	0.0660	0.92	1.063	0.357	0.1207	2.96	1.429
Wound care								
Pressure ulcer, stage III	-0.004	0.1578	-0.02	0.996	0.220	0.2036	1.08	1.246
Pressure ulcer, stage IV	0.298	0.1570	1.90	1.347	0.755	0.2211	3.41	2.127
Pressure ulcer, unstageable	-0.049	0.2160	-0.23	0.952	-0.426	0.3502	-1.22	0.653
Wound with morbid obesity	-0.214	0.2142	-1.00	0.808	-0.005	0.2236	-0.02	0.995
Severe wound	0.102	0.1183	0.87	1.108	0.093	0.1729	0.54	1.097
Osteomyelitis	-0.046	0.1124	-0.41	0.955	0.317	0.1705	1.86	1.373
Fistula	0.953	0.1763	5.41	2.593	1.344	0.3261	4.12	3.835
Infected wound	0.124	0.1327	0.94	1.132	0.579	0.1745	3.32	1.784
Nursing home surgical wound	0.254	0.1263	2.01	1.289	0.655	0.2146	3.05	1.926
Number of body systems ≥ 5	0.140	0.0914	1.53	1.150	0.042	0.1178	0.36	1.043
Disabled	0.002	0.0373	0.06	1.002	0.066	0.0772	0.85	1.068
Home health agency patient	-1.324	0.0614	-21.55	0.266				
Constant	8.597	0.1412	60.90	5413.6	6.306	0.2589	24.36	548.1
N	6,409				2,542			

Notes: JFI = Jen Frailty Index. The Poisson regression was weighted by setting. Standard errors are clustered by provider.

^a Orthopedic major surgery is the omitted group.

TABLE 8

Comparison of Actual and Predicted Cost of Stays under a Full Model for a PAC PPS

Modeled using the stays in the PAC-PRD

	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Model R-squared	Setting R-squared	Stay counts	Distribution of Stays by Setting			
							HHA	SNF	IRF	LTCH
HHA	2,545	2,545	1.00	0.05	0.09	3,867				
SNF	11,833	12,263	1.04	0.27	0.34	774				
IRF	14,675	14,245	0.97	0.14	0.26	1,062				
LTC	44,422	35,396	0.80	0.26	0.42	706				
LTCH qualifying stays	51,511	43,353	0.84			450				
All	5,771	5,771	1.00	0.60		6,409				
Ventilator	48,627	48,627	1.00			177	2%	2%	1%	95%
Severe wound	7,634	7,535	0.99			318	37%	2%	11%	50%
Stroke	10,560	10,560	1.00			260	25%	11%	61%	3%
Other neurology medical	4,458	4,458	1.00			512	79%	7%	12%	2%
Other neurology surgical	12,957	12,625	0.97			77	19%	6%	68%	6%
Orthopedic medical	5,189	5,297	1.02			478	76%	14%	10%	1%
Orthopedic surgical	6,619	6,616	1.00			1,092	49%	23%	27%	1%
Respiratory medical	5,987	6,106	1.02			510	60%	13%	9%	17%
Respiratory surgical	5,546	5,488	0.99			49	53%	18%	16%	12%
Cardiovascular medical	4,802	4,769	0.99			590	76%	13%	6%	5%
Cardiovascular surgical	4,220	4,185	0.99			347	67%	8%	17%	8%
Infection medical	7,845	8,058	1.03			122	43%	17%	14%	26%
Infection surgical	7,971	7,695	0.97			33	45%	6%	15%	33%
Hematology medical	5,463	5,194	0.95			52	77%	13%	8%	2%
Hematology surgical	7,874	7,874	1.00			13	46%	23%	31%	0%
Rehabilitation medical	3,973	3,804	0.96			328	69%	2%	29%	0%
Skin medical	4,704	4,582	0.97			208	79%	10%	5%	6%
Skin surgical	6,348	6,225	0.98			27	70%	11%	4%	15%
Serious mental illness	6,157	6,077	0.99			196	58%	9%	16%	17%
Other_med	4,470	4,504	1.01			652	78%	10%	6%	5%
Other surgical	6,650	6,644	1.00			309	46%	13%	16%	26%
Other (not otherwise grouped)	4,550	4,861	1.07			21	62%	14%	19%	5%
Low functional status	11,808	11,413	0.97			2,047	24%	20%	30%	26%
High functional status	2,162	2,256	1.04			1,402	97%	1%	0%	1%
Least frail	2,633	3,126	1.19			378	90%	6%	2%	1%
Most frail	10,053	9,504	0.95			648	32%	17%	26%	25%
Cognitively impaired	6,693	6,654	0.99			2,575	55%	12%	18%	15%
Severely ill (SOI level =4)	23,386	22,914	0.98			454	0%	9%	26%	65%
Highest acuity	43,279	28,490	0.66			7	0%	0%	0%	100%
Multiple body system diagnoses	26,781	26,080	0.97			115	0%	11%	20%	69%
Chronically critically ill	11,587	11,676	1.01			763	25%	7%	21%	46%
Community admitted	3,222	3,102	0.96			1,781	90%	2%	6%	3%

	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Model R- squared	Setting R- squared	Stay counts	Distribution of Stays by Setting			
							HHA	SNF	IRF	LTCH
Stays with prior hospital stay	6,880	6,932	1.01			4,628	49%	16%	21%	14%
Disabled	5,833	5,833	1.00			1,284	57%	9%	17%	17%
Dual-eligible	6,296	6,148	0.98			1,253	59%	11%	13%	17%
ESRD	7,242	7,246	1.00			214	46%	9%	14%	31%

Source: PAC-PRD stays, 2008–2010 Medicare claims that matched the PAC-PRD stays, Medicare 2008–2010 risk score files, and Medicare cost reports for 2013.

Notes: PAC-PRD = postacute care payment reform demonstration; SOI = severity of illness; CCI = chronically critically ill, ESRD = end-stage renal disease. The table shows the ratios of average predicted costs compared to the average actual costs for the sample PAC-PRD stays included in each group. A predicted-to-actual ratio of 1.0 indicates that the average predicted costs are equal to the average actual costs and that the model would establish accurate relative weights for a payment system. The sample is based on stays included in CMS's PAC-PRD between 2008 and 2010 (n = 6,409 stays). The full model was based on unique patient assessment information and routine resource-use data collected during CMS's PAC-PRD, as well as readily available administrative data, such as claims information from PAC stays and preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores, and cost report information for PAC providers. The model combines the results of a model that predicts the costs of routine and therapy combined and one that predicts nontherapy ancillary costs. Patients' level of function was determined using Rasch motor scores at PAC admission. Patients' level of frailty was determined using a frailty index. CCI stays include patients who spent eight or more days in an intensive care unit during the preceding hospital stay or were on a ventilator in the PAC setting. Severely ill stays include patients who were categorized as SOI level 4 during the immediately preceding hospital stay. Multiple body systems include patients with diagnoses involving five or more body systems. Highest acuity patients were those categorized as SOI level 4 who received PAC in institutional settings only, were on dialysis, and had severe wounds or pressure ulcers.

TABLE 9

Comparison of Actual and Predicted Cost of Stays under an Administrative Model for a PAC PPS

Modeled using the stays in the PAC-PRD

	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Model R-squared	Setting R-squared	Stay counts	Distribution of stays by setting			
							HHA	SNF	IRF	LTCH
HHA	\$2,545	\$2,545	1.00	0.03	0.06	3,867				
SNF	11,833	12,318	1.04	0.26	0.31	774				
IRF	14,675	14,498	0.99	0.09	0.20	1,062				
LTC	44,422	33,008	0.74	0.25	0.45	706				
LTCH qualifying stays	51,511	40,684	0.79			450				
All	5,771	5,771	1.00	0.57		6,409				
Ventilator	48,627	45,187	0.93			177	2%	2%	1%	95%
Severe wound	7,634	7,553	0.99			318	37%	2%	11%	50%
Stroke	10,560	10,560	1.00			260	25%	11%	61%	3%
Other neurology medical	4,458	4,462	1.00			512	79%	7%	12%	2%
Other neurology surgical	12,957	12,617	0.97			77	19%	6%	68%	6%
Orthopedic medical	5,189	5,365	1.03			478	76%	14%	10%	1%
Orthopedic surgical	6,619	6,639	1.00			1,092	49%	23%	27%	1%
Respiratory medical	5,987	6,166	1.03			510	60%	13%	9%	17%
Respiratory surgical	5,546	5,497	0.99			49	53%	18%	16%	12%
Cardiovascular medical	4,802	4,805	1.00			590	76%	13%	6%	5%
Cardiovascular surgical	4,220	4,136	0.98			347	67%	8%	17%	8%
Infection medical	7,845	7,998	1.02			122	43%	17%	14%	26%
Infection surgical	7,971	7,807	0.98			33	45%	6%	15%	33%
Hematology medical	5,463	5,329	0.98			52	77%	13%	8%	2%
Hematology surgical	7,874	7,874	1.00			13	46%	23%	31%	0%
Rehabilitation medical	3,973	3,647	0.92			328	69%	2%	29%	0%
Skin medical	4,704	4,538	0.96			208	79%	10%	5%	6%
Skin surgical	6,348	6,521	1.03			27	70%	11%	4%	15%
Serious mental illness	6,157	6,105	0.99			196	58%	9%	16%	17%
Other medical	4,470	4,510	1.01			652	78%	10%	6%	5%
Other surgical	6,650	6,729	1.01			309	46%	13%	16%	26%
Other (not otherwise grouped)	4,550	4,640	1.02			21	62%	14%	19%	5%
Low functional status	11,808	10,613	0.90			2,047	24%	20%	30%	26%
High functional status	2,162	2,637	1.22			1,402	97%	1%	0%	1%
Least frail	2,633	2,864	1.09			378	90%	6%	2%	1%
Most frail	10,053	9,963	0.99			648	32%	17%	26%	25%
Cognitively impaired	6,693	6,441	0.96			2,575	55%	12%	18%	15%
Severely ill (SOI level =4)	23,386	22,801	0.97			454	0%	9%	26%	65%
Highest acuity	43,279	31,928	0.74			7	0%	0%	0%	100%
Multiple body system diagnoses	26,781	25,810	0.96			115	0%	11%	20%	69%
Chronically critically ill	11,587	11,503	0.99			763	25%	7%	21%	46%
Community admitted	3,222	2,939	0.91			1,781	90%	2%	6%	3%

	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Model R-squared	SettingR-squared	Stay counts	Distribution of stays by setting			
							HHA	SNF	IRF	LTCH
Stays with prior hospital stay	6,880	7,003	1.02			4,628	49%	16%	21%	14%
Disabled	5,833	5,833	1.00			1,284	57%	9%	17%	17%
Dual-eligible	6,296	6,134	0.97			1,253	59%	11%	13%	17%
ESRD	7,242	7,197	0.99			214	46%	9%	14%	31%

Source: PAC-PRD stays, 2008–2010 Medicare claims that matched the PAC-PRD stays, Medicare 2008–2010 risk score files, and Medicare cost reports for 2013.

Note: PAC-PRD = postacute care payment reform demonstration; SOI = severity of illness; CCI = chronically critically ill, ESRD = end-stage renal disease. The table shows the ratios of average predicted costs compared to the average actual costs for the sample PAC-PRD stays included in each group. A predicted-to-actual ratio of 1.0 indicates that the average predicted costs are equal to the average actual costs and that the model would establish accurate relative weights for a payment system. The sample is based on stays included in CMS's PAC-PRD between 2008 and 2010 (n = 6,409 stays). The full model was based on readily available administrative data such as claims information from PAC stays and preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores, and cost report information for PAC providers. The model combines the results of a model that predicts the costs of routine and therapy combined and one that predicts nontherapy ancillary costs. Patients' level of frailty was determined using a frailty index. CCI stays include patients who spent eight or more days in an intensive care unit during the preceding hospital stay or were on a ventilator in the PAC setting. Severely ill stays include patients who were categorized as SOI level 4 during the immediately preceding hospital stay. Multiple body systems include patients with diagnoses involving five or more body systems. Highest acuity patients were those categorized as SOI level 4 who received PAC in institutional settings only, were on dialysis, and had severe wounds or pressure ulcers.

TABLE 10

Administrative Models of Costs per Stay: 2013 PAC Stays

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Age minus fifty (capped at 45)								
Age - 50	-0.0011	0.0003	-4.44	0.9989	0.0001	0.0006	0.14	1.0001
Age -50 squared	0.00007	0.0000	15.99	1.0001	-0.00022	0.0000	-20.24	0.9998
Age less than 50	-0.068	0.0036	-19.04	0.935	0.105	0.0100	10.58	1.111
Cognitive function								
Coma	0.059	0.0072	8.09	1.060	0.148	0.0143	10.39	1.160
Dementia with complications (HCC51)	-0.021	0.0041	-5.24	0.979	-0.021	0.0074	-2.88	0.979
Dementia without complications (HCC52)	0.005	0.0043	1.23	1.005	0.038	0.0093	4.12	1.039
Schizophrenia (HCC57)	-0.052	0.0084	-6.18	0.950	0.078	0.0158	4.93	1.081
Major Depressive, Bipolar, and Paranoid Disorders (HCC58)	0.054	0.0074	7.36	1.056	0.172	0.0121	14.18	1.187
Ability to function (JFI index components)								
Minor ambulatory limitations	0.123	0.0032	38.39	1.131	0.052	0.0076	6.86	1.054
Severe ambulatory limitations	0.090	0.0015	58.64	1.094	-0.020	0.0038	-5.14	0.980
Cognitive developmental disability	0.035	0.0014	24.26	1.035	0.043	0.0041	10.50	1.044
Chronic mental illness	0.098	0.0065	15.20	1.103	-0.043	0.0204	-2.13	0.958
Dementia	0.069	0.0044	15.74	1.071	0.055	0.0092	5.93	1.056
Sensory disorders	-0.002	0.0030	-0.51	0.998	0.007	0.0048	1.36	1.007
Selfcare impairment	0.045	0.0017	26.15	1.046	0.145	0.0060	24.27	1.157
Syncope	0.020	0.0018	10.81	1.020	-0.032	0.0046	-6.86	0.969
Cancer	-0.008	0.0026	-3.05	0.992	-0.025	0.0069	-3.66	0.975
Chronic medical disease	0.021	0.0015	14.33	1.022	0.079	0.0036	22.01	1.082
Pneumonia	0.012	0.0024	5.09	1.012	0.163	0.0065	24.88	1.177
Renal disorders	0.036	0.0033	11.13	1.037	0.259	0.0086	29.99	1.296
Systemic disorders (e.g., septicemia)	0.101	0.0015	69.15	1.106	0.165	0.0043	38.89	1.180
Primary reason for treatment^a								
Stroke	0.239	0.0048	49.71	1.270	0.170	0.0079	21.40	1.185
Neurological surgical	0.221	0.0070	31.44	1.247	0.244	0.0254	9.62	1.277
Neurological medical	0.107	0.0040	26.90	1.113	0.115	0.0075	15.33	1.122
Respiratory trach/vent	0.227	0.0067	33.89	1.255	0.357	0.0155	23.06	1.429
Respiratory surgical	0.016	0.0070	2.22	1.016	0.236	0.0172	13.78	1.267
Respiratory medical	0.025	0.0040	6.29	1.026	0.196	0.0091	21.56	1.217
COPD	-0.002	0.0050	-0.47	0.998	0.395	0.0113	35.04	1.484
Cardiovascular vascular surgical	0.158	0.0053	30.03	1.171	0.282	0.0229	12.29	1.326
Cardiovascular cardiac surgical	-0.016	0.0050	-3.31	0.984	-0.034	0.0099	-3.48	0.966
Cardiovascular general medical	-0.018	0.0043	-4.17	0.982	0.092	0.0082	11.18	1.097
Orthopedic minor surgical	0.231	0.0035	66.71	1.260	0.408	0.0066	61.84	1.503
Orthopedic spinal	0.147	0.0063	23.31	1.159	0.092	0.0093	9.89	1.096

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Orthopedic minor medical	0.156	0.0046	33.83	1.169	0.286	0.0073	39.24	1.330
Orthopedic major medical	0.199	0.0045	44.66	1.221	0.239	0.0084	28.63	1.270
Skin surgical	0.322	0.0099	32.56	1.380	0.688	0.0332	20.75	1.990
Skin medical	0.090	0.0048	18.53	1.094	0.330	0.0138	23.91	1.391
Endocrine surgical	0.164	0.0086	19.07	1.178	0.400	0.0182	21.99	1.491
Endocrine medical	0.089	0.0051	17.68	1.093	0.082	0.0087	9.40	1.085
Kidney & urinary surgical	-0.099	0.0069	-14.37	0.906	0.083	0.0166	4.97	1.086
Kidney & urinary medical	-0.093	0.0044	-21.03	0.911	0.016	0.0075	2.06	1.016
Infections surgical	0.189	0.0059	31.87	1.208	0.405	0.0123	32.88	1.499
Infections medical	0.108	0.0067	16.00	1.114	0.448	0.0151	29.64	1.565
Infections septicemia	-0.101	0.0049	-20.86	0.904	0.126	0.0121	10.44	1.134
Transplant	0.080	0.0314	2.56	1.084	0.533	0.0465	11.46	1.704
GI & liver minor surgical	0.055	0.0054	10.14	1.056	0.100	0.0134	7.44	1.105
GI & liver major surgical	0.247	0.0054	45.59	1.280	0.221	0.0153	14.39	1.247
GI & liver minor medical	0.052	0.0045	11.64	1.054	0.126	0.0096	13.09	1.135
GI & liver major medical	-0.080	0.0047	-17.19	0.923	0.035	0.0086	4.09	1.036
Hematology surgical	-0.027	0.0129	-2.11	0.973	0.241	0.0311	7.76	1.273
Hematology medical	-0.113	0.0063	-17.99	0.893	0.063	0.0117	5.44	1.065
Other surgery	0.077	0.0052	14.80	1.080	0.347	0.0121	28.78	1.415
Other medical	0.065	0.0048	13.45	1.067	0.143	0.0091	15.69	1.154
Other (not otherwise grouped)	-0.480	0.2109	-2.27	0.619	0.214	0.3983	0.54	1.239
Death	-0.864	0.2193	-3.94	0.421	-1.099	0.2455	-4.48	0.332
Vent	0.978	0.0120	81.23	2.659	1.754	0.0184	95.35	5.779
Comorbidities								
Alcohol or drug disease	0.011	0.0040	2.88	1.011	-0.167	0.0071	-23.40	0.847
Cancer	-0.020	0.0026	-7.74	0.980	-0.009	0.0069	-1.26	0.991
Cardiac and Vascular	0.010	0.0011	9.32	1.010	0.036	0.0029	12.72	1.037
Complications of device or graft	-0.061	0.0035	-17.34	0.941	0.114	0.0081	14.12	1.121
Dementia	-0.049	0.0032	-15.52	0.952	-0.108	0.0084	-12.90	0.898
Eye disorders	0.203	0.0146	13.87	1.225	-0.058	0.0358	-1.61	0.944
GI and liver	-0.001	0.0020	-0.48	0.999	0.070	0.0050	13.98	1.072
Head and spine	0.108	0.0022	48.16	1.114	0.060	0.0063	9.63	1.062
Hematologic + immunologic disease	-0.009	0.0017	-5.24	0.991	0.003	0.0041	0.72	1.003
HIV/AIDS	-0.030	0.0112	-2.72	0.970	0.341	0.0237	14.40	1.406
Mental illness	0.027	0.0068	3.98	1.027	-0.159	0.0115	-13.83	0.853
Metabolic endocrine	0.047	0.0011	42.55	1.048	0.131	0.0034	38.05	1.140
Neuro excluding stroke	0.032	0.0015	21.46	1.032	0.046	0.0038	12.14	1.048
Obesity	-0.030	0.0022	-13.66	0.970	0.062	0.0058	10.78	1.064
Orthopedic	0.047	0.0016	29.92	1.048	0.076	0.0044	17.26	1.079
Renal	-0.046	0.0032	-14.32	0.955	-0.218	0.0086	-25.50	0.804
Respirator dependence	0.047	0.0103	4.55	1.048	-0.021	0.0155	-1.35	0.979
Respiratory	-0.001	0.0012	-1.12	0.999	0.133	0.0035	38.07	1.142

Predictor	Routine and Therapy Costs per Stay				Nontherapy Ancillary Costs per Stay			
	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Septicemia + Other systemic infection	0.121	0.0030	40.76	1.128	0.045	0.0067	6.63	1.046
Skin disorders	0.070	0.0019	36.20	1.072	0.048	0.0059	8.10	1.049
Stroke	0.177	0.0023	76.54	1.193	0.094	0.0051	18.36	1.098
Transplant	-0.025	0.0103	-2.44	0.975	0.144	0.0237	6.08	1.155
Treatments and impairments								
Bowel incontinence	0.163	0.0120	13.49	1.177	0.248	0.0221	11.24	1.282
Continuous positive airflow pressure	0.282	0.0161	17.54	1.325	0.777	0.0244	31.80	2.175
Swallowing	0.149	0.0028	52.37	1.160	0.060	0.0072	8.33	1.062
Risk score	0.003	0.0004	7.69	1.003	0.018	0.0010	18.35	1.018
Total number of ICU and CCU days (capped)	0.009	0.0003	29.13	1.009	0.013	0.0007	19.38	1.013
Severity level								
Zero	0.526	0.1999	2.63	1.692	-0.022	0.3509	-0.06	0.978
Two	-0.014	0.0017	-7.98	0.987	0.010	0.0033	2.96	1.010
Three	-0.041	0.0022	-18.85	0.960	0.064	0.0052	12.32	1.066
Four	-0.048	0.0031	-15.38	0.953	0.167	0.0085	19.59	1.182
Wound care								
Pressure ulcer, stage III	0.130	0.0079	16.42	1.139	0.238	0.0154	15.47	1.269
Pressure ulcer, stage IV	0.153	0.0083	18.46	1.166	0.366	0.0168	21.84	1.442
Pressure ulcer, unstageable	0.174	0.0102	17.04	1.190	0.017	0.0187	0.93	1.018
Wound with morbid obesity	0.060	0.0082	7.36	1.062	0.177	0.0140	12.65	1.193
Severe wound	0.075	0.0085	8.77	1.078	0.343	0.0133	25.80	1.410
Osteomyelitis	0.163	0.0099	16.48	1.177	0.425	0.0153	27.74	1.530
Fistula	0.466	0.0235	19.84	1.593	0.738	0.0408	18.09	2.091
Infected wound	0.115	0.0082	14.07	1.122	0.295	0.0136	21.68	1.343
nh surgical wound	0.241	0.0134	17.98	1.272	0.341	0.0225	15.20	1.407
Number of body systems ≥ 5	-0.122	0.0019	-63.89	0.886	-0.030	0.0048	-6.20	0.971
Disabled	-0.016	0.0015	-10.49	0.984	0.012	0.0047	2.53	1.012
Home health agency patient	-1.410	0.0053	-266.90	0.244				
Constant	8.802	0.0077	1141.3	6647.4	6.778	0.0145	466.82	878.3

Notes: JFI = Jen Frailty Index. The Poisson regression was weighted by setting. Standard errors are clustered by provider.

^a Orthopedic major surgery is the omitted group.

TABLE 11

Comparison of Actual Costs, Predicted Costs, Actual Payments, and Simulated Payments under a PAC PPS for PAC Stays in 2013

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (\$)	Ratio of PAC PPS payment to actual 2013 payment	Stay count	Distribution of Stays by Setting			
								HHA	SNF	IRF	LTCH
HHA	2,269	2,269	1.00	2,731	2,691	0.99	6,108,960				
SNF	11,281	12,289	1.09	13,502	14,571	1.08	2,266,204				
IRF	15,446	13,569	0.88	18,232	16,089	0.88	378,163				
LTC	36,521	25,006	0.68	39,624	29,651	0.75	136,665				
LTC_CCI_by_law	41,467	31,318	0.76	44,863	37,134	0.83	78,378				
All	5,653	5,653	1.00	6,703	6,703	1.00	8,889,992				
Hospital based	7,463	6,160	0.83	6,436	7,304	1.13	964,562	64.2%	15.4%	20.4%	0.0%
Freestanding	5,433	5,592	1.03	6,736	6,630	0.98	7,925,430	69.3%	26.7%	2.3%	1.7%
Frontier	5,064	4,894	0.97	5,417	5,803	1.07	26,818	71.5%	28.2%	0.3%	0.0%
Metro	5,692	5,690	1.00	6,778	6,747	1.00	7,593,994	68.8%	24.8%	4.6%	1.7%
Rural micropolitan	5,701	5,618	0.99	6,480	6,661	1.03	805,321	66.8%	29.6%	3.0%	0.7%
Rural adjacent	5,239	5,418	1.03	6,295	6,424	1.02	286,384	67.4%	32.1%	0.4%	0.1%
Rural nonadjacent	4,618	4,750	1.03	5,382	5,632	1.05	204,293	74.1%	25.2%	0.7%	0.1%
Urban CBSA based	5,703	5,702	1.00	6,794	6,761	1.00	7,450,169	68.8%	24.8%	4.7%	1.7%
Rural CBSA based	5,399	5,403	1.00	6,234	6,406	1.03	1,439,823	68.5%	28.9%	2.1%	0.5%
Low income share 0-20th percentile (IRF only)	14,722	13,264	0.90	17,314	15,727	0.91	71,163	0.0%	0.0%	100.0%	0.0%
Low income share 20-40th percentile (IRF only)	14,604	13,275	0.91	17,545	15,740	0.90	89,643	0.0%	0.0%	100.0%	0.0%
Low income share 40-60th percentile (IRF only)	15,395	13,614	0.88	18,068	16,142	0.89	76,171	0.0%	0.0%	100.0%	0.0%
Low income share 60-80th percentile (IRF only)	15,194	13,731	0.90	18,420	16,281	0.88	80,672	0.0%	0.0%	100.0%	0.0%
Low income share 80+ percentile (IRF only)	17,996	14,126	0.78	20,480	16,749	0.82	56,088	0.0%	0.0%	100.0%	0.0%
Teaching (IRF only)	16,808	14,010	0.83	19,564	16,612	0.85	45,066	0.0%	0.0%	100.0%	0.0%
Nonprofit	6,259	6,028	0.96	6,471	7,147	1.10	1,975,362	64.6%	26.0%	8.5%	0.9%
For profit	5,385	5,496	1.02	6,730	6,516	0.97	6,638,037	70.4%	25.1%	2.8%	1.7%
Government	7,773	6,769	0.87	7,722	8,026	1.04	276,593	58.1%	30.9%	9.4%	1.5%
Ventilator	51,219	51,219	1.00	56,694	60,731	1.07	34,324	6.1%	13.9%	1.0%	79.0%
Severe wound	8,082	7,868	0.97	8,782	9,329	1.06	404,877	71.2%	15.4%	3.8%	9.6%
Stroke	12,181	12,164	1.00	14,351	14,423	1.00	176,508	30.1%	41.0%	28.1%	0.8%
Other neurology medical	4,401	4,394	1.00	5,562	5,210	0.94	672,372	80.3%	16.6%	2.8%	0.3%

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (\$)	Ratio of PAC PPS payment to actual 2013 payment	Stay count	Distribution of Stays by Setting			
								HHA	SNF	IRF	LTCH
Other neurology surgical	11,038	11,057	1.00	12,179	13,110	1.08	53,125	37.5%	34.1%	26.7%	1.7%
Orthopedic medical	4,190	4,187	1.00	5,282	4,964	0.94	871,921	83.0%	15.0%	1.9%	0.2%
Orthopedic surgical	7,711	7,727	1.00	9,392	9,163	0.98	849,303	44.3%	43.6%	11.7%	0.4%
Respiratory medical	5,868	5,945	1.01	6,681	7,049	1.06	774,504	62.3%	33.5%	2.3%	1.8%
Respiratory surgical	6,492	6,563	1.01	7,103	7,781	1.10	32,211	56.9%	34.1%	5.9%	3.1%
Cardiovascular medical	3,781	3,786	1.00	4,502	4,489	1.00	1,287,716	80.8%	17.5%	1.3%	0.5%
Cardiovascular surgical	6,952	7,030	1.01	7,656	8,335	1.09	252,272	52.8%	36.1%	9.5%	1.7%
Infection medical	8,736	8,822	1.01	10,276	10,460	1.02	262,852	35.0%	57.4%	3.6%	3.9%
Infection surgical	11,706	12,211	1.04	11,915	14,479	1.22	41,438	31.2%	54.7%	7.4%	6.6%
Hematology medical	3,521	3,536	1.00	3,915	4,193	1.07	157,558	80.2%	18.3%	1.1%	0.4%
Hematology surgical	6,284	6,383	1.02	7,001	7,568	1.08	6,198	53.8%	37.5%	7.1%	1.6%
Rehabilitation medical	4,764	4,696	0.99	6,277	5,568	0.89	456,306	76.0%	14.8%	9.1%	0.0%
Skin medical	3,683	3,602	0.98	4,253	4,271	1.00	351,877	86.9%	12.0%	0.6%	0.5%
Skin surgical	7,644	8,534	1.12	8,207	10,118	1.23	20,787	57.1%	36.6%	2.3%	4.0%
Serious mental illness	7,323	7,298	1.00	8,690	8,654	1.00	423,076	56.7%	35.7%	4.3%	3.3%
Other medical	4,415	4,412	1.00	5,251	5,232	1.00	1,370,189	76.1%	22.0%	1.3%	0.5%
Other surgical	8,514	8,453	0.99	9,022	10,023	1.11	234,105	48.3%	41.0%	7.1%	3.6%
Other (not otherwise grouped)	4,682	4,637	0.99	6,889	5,498	0.80	173	68.8%	31.2%	0.0%	0.0%
Least frail	2,668	2,681	1.00	3,308	3,178	0.96	634,513	91.9%	7.5%	0.5%	0.0%
Most frail	9,645	9,567	0.99	11,188	11,344	1.01	945,950	38.0%	49.3%	8.7%	4.0%
Cognitively impaired	6,967	6,962	1.00	8,610	8,255	0.96	1,764,720	57.1%	37.7%	3.5%	1.7%
Severely ill (SOI level =4)	17,740	17,739	1.00	19,625	21,033	1.07	384,955	0.0%	71.1%	11.8%	17.1%
Highest acuity	29,593	23,750	0.80	31,705	28,160	0.89	3,446	0.0%	33.6%	12.0%	54.5%
Multiple body systems	16,033	16,035	1.00	18,310	19,013	1.04	483,717	0.0%	76.2%	10.3%	13.5%
Chronically critically ill (CCI)	14,375	14,445	1.00	15,772	17,128	1.09	422,126	30.6%	45.9%	10.2%	13.3%
Region 1	5,154	5,680	1.10	6,238	6,735	1.08	530,546	66.1%	29.3%	3.4%	1.2%
Region 2	6,307	6,558	1.04	7,540	7,776	1.03	622,660	58.3%	36.6%	4.7%	0.4%
Region 3	6,050	6,306	1.04	7,022	7,477	1.06	828,826	62.5%	30.7%	5.8%	1.0%
Region 4	5,296	5,248	0.99	6,367	6,223	0.98	2,148,640	72.9%	22.4%	3.6%	1.2%
Region 5	6,002	6,039	1.01	6,979	7,161	1.03	1,568,457	64.8%	30.1%	3.7%	1.3%
Region 6	4,998	4,656	0.93	5,978	5,521	0.92	1,648,037	78.9%	13.4%	4.8%	2.9%
Region 7	6,783	6,903	1.02	7,695	8,185	1.06	325,867	55.9%	37.1%	5.4%	1.6%
Region 8	6,597	6,224	0.94	7,287	7,379	1.01	168,067	62.9%	30.8%	4.8%	1.5%
Region 9	5,867	5,885	1.00	7,248	6,978	0.96	864,173	68.3%	25.6%	4.2%	1.8%

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (\$)	Ratio of PAC PPS payment to actual 2013 payment	Stay count	Distribution of Stays by Setting			
								HHA	SNF	IRF	LTCH
Region 10	6,298	6,126	0.97	7,007	7,264	1.04	184,719	63.5%	32.6%	3.1%	0.8%
HHA therapy share of stay cost=0	1,207	2,198	1.82	1,931	2,606	1.35	2,593,492	100.0%	0.0%	0.0%	0.0%
HHA therapy share of stay cost LE 50%	1,943	2,328	1.20	2,176	2,761	1.27	460,980	100.0%	0.0%	0.0%	0.0%
HHA therapy share of stay costs 50-75%	2,951	2,323	0.79	3,066	2,754	0.90	1,527,225	100.0%	0.0%	0.0%	0.0%
HHA therapy share of stay costs >75%	3,488	2,318	0.66	3,923	2,748	0.70	1,527,240	100.0%	0.0%	0.0%	0.0%
Institutional PAC therapy share of stay costs 0-25%	14,408	15,222	1.06	14,022	18,049	1.29	695,252	0.0%	67.6%	13.2%	19.2%
Institutional PAC therapy share of stay costs 25-50%	12,183	12,632	1.04	13,479	14,978	1.11	695,251	0.0%	76.8%	22.9%	0.4%
Institutional PAC therapy share of stay costs 50-75%	12,616	12,380	0.98	16,170	14,680	0.91	695,252	0.0%	86.7%	13.3%	0.0%
Institutional PAC therapy share of stay costs >75%	13,144	12,117	0.92	18,045	14,367	0.80	695,258	0.0%	94.9%	5.1%	0.0%
SNF shortest 10th percentile	3,022	12,257	4.06	1,069	14,533	13.59	229,973	0.0%	100.0%	0.0%	0.0%
IRF shortest 10th percentile	8,503	12,941	1.52	8,972	15,344	1.71	44,847	0.0%	0.0%	100.0%	0.0%
LTCH shortest 10th percentile	12,503	23,462	1.88	7,999	27,820	3.48	14,550	0.0%	0.0%	0.0%	100.0%
HHA LUPA	772	2,191	2.84	347	2,598	7.49	540,432	100.0%	0.0%	0.0%	0.0%
Community admitted	2,850	2,854	1.00	3,558	3,383	0.95	4,447,900	93.5%	5.2%	1.1%	0.3%
Stays with prior hospital stay	8,461	8,457	1.00	9,853	10,028	1.02	4,442,092	43.9%	45.9%	7.5%	2.8%
Disabled	5,517	5,517	1.00	6,479	6,541	1.01	2,314,264	71.8%	22.0%	3.8%	2.4%
Dual eligible	5,572	5,543	0.99	6,792	6,572	0.97	2,876,623	71.0%	24.5%	2.5%	2.0%
ESRD	6,856	6,872	1.00	7,937	8,148	1.03	386,250	61.6%	29.8%	4.6%	4.0%
Very old (85+ years old)	5,687	5,678	1.00	6,895	6,733	0.98	2,647,695	67.0%	29.2%	3.1%	0.7%

Source: 2013 Medicare acute hospital and PAC claims, Medicare 2013 risk score file, and Medicare cost reports for 2013.

Note: PAC-PRD = postacute care payment reform demonstration; SOI = severity of illness; CCI = chronically critically ill; ESRD = end-stage renal disease. The table shows the ratios of average predicted costs compared to the average actual costs for the sample PAC-PRD stays included in each group. A predicted-to-actual ratio of 1.0 indicates that the average predicted costs are equal to the average actual costs

and that the model would establish accurate relative weights for a payment system. The sample is based on stays included in CMS's PAC-PRD between 2008 and 2010 (n = 6,409 stays). The full model was based on readily available administrative data such as claims information from PAC stays and preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores, and cost report information for PAC providers. The model combines the results of a model that predicts the costs of routine and therapy combined and one that predicts nontherapy ancillary costs. Patients' level of frailty was determined using a frailty index. CCI stays include patients who spent 8 or more days in an intensive care unit during the preceding hospital stay or were on a ventilator in the PAC setting. Severely ill stays include patients who were categorized as SOI level 4 during the immediately preceding hospital stay. Multiple body systems include patients with diagnoses involving five or more body systems. Highest acuity patients were those categorized as SOI level 4 who received PAC in institutional settings only, were on dialysis, and had severe wounds or pressure ulcers.

TABLE 12

Comparison of Actual Costs, Predicted Costs, Actual Payments, and Simulated Payments under a PAC PPS with and without an Illustrative High-Cost Outlier Policy for PAC Stays in 2013

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (no outlier policy) (\$)	Ratio of PAC PPS payment to actual 2013 payment	PAC PPS payment with outlier policy (\$)	Ratio PAC PPS with outlier policy to actual 2013 payment
HHA	\$2,269	2,269	1.00	2,731	2,691	0.99	2,691	0.99
SNF	11,281	12,289	1.09	13,502	14,571	1.08	14,355	1.06
IRF	15,446	13,569	0.88	18,232	16,089	0.88	15,840	0.87
LTC	36,521	25,006	0.68	39,624	29,651	0.75	33,914	0.86
LTC_CCI_by_law	41,467	31,318	0.76	44,863	37,134	0.83	41,549	0.93
All	5,653	5,653	1.00	6,703	6,703	1.00	6,703	1.00
Hospital based	7,463	6,160	0.83	6,436	7,304	1.13	7,340	1.14
Freestanding	5,433	5,592	1.03	6,736	6,630	0.98	6,626	0.98
Frontier	5,064	4,894	0.97	5,417	5,803	1.07	5,871	1.08
Metro	5,692	5,690	1.00	6,778	6,747	1.00	6,745	1.00
Rural micropolitan	5,701	5,618	0.99	6,480	6,661	1.03	6,684	1.03
Rural adjacent	5,239	5,418	1.03	6,295	6,424	1.02	6,420	1.02
Rural nonadjacent	4,618	4,750	1.03	5,382	5,632	1.05	5,636	1.05
Urban CBSA based	5,703	5,702	1.00	6,794	6,761	1.00	6,758	0.99
Rural CBSA based	5,399	5,403	1.00	6,234	6,406	1.03	6,422	1.03
Low income share 0-20th percentile (IRF only)	14,722	13,264	0.90	17,314	15,727	0.91	15,346	0.89
Low income share 20-40th percentile (IRF only)	14,604	13,275	0.91	17,545	15,740	0.90	15,323	0.87
Low income share 40-60th percentile (IRF only)	15,395	13,614	0.88	18,068	16,142	0.89	15,842	0.88
Low income share 60-80th percentile (IRF only)	15,194	13,731	0.90	18,420	16,281	0.88	16,045	0.87
Low income share 80+ percentile (IRF only)	17,996	14,126	0.78	20,480	16,749	0.82	16,984	0.83
Teaching (IRF only)	16,808	14,010	0.83	19,564	16,612	0.85	16,662	0.85
Nonprofit	6,259	6,028	0.96	6,471	7,147	1.10	7,131	1.10
For profit	5,385	5,496	1.02	6,730	6,516	0.97	6,514	0.97
Government	7,773	6,769	0.87	7,722	8,026	1.04	8,194	1.06
Ventilator	51,219	51,219	1.00	56,694	60,731	1.07	64,351	1.14
Severe wound	8,082	7,868	0.97	8,782	9,329	1.06	9,614	1.09
Stroke	12,181	12,164	1.00	14,351	14,423	1.00	14,314	1.00
Other neurology medical	4,401	4,394	1.00	5,562	5,210	0.94	5,216	0.94
Other neurology surgical	11,038	11,057	1.00	12,179	13,110	1.08	13,104	1.08

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (no outlier policy) (\$)	Ratio of PAC PPS payment to actual 2013 payment	PAC PPS payment with outlier policy (\$)	Ratio PAC PPS with outlier policy to actual 2013 payment
Orthopedic medical	4,190	4,187	1.00	5,282	4,964	0.94	4,897	0.93
Orthopedic surgical	7,711	7,727	1.00	9,392	9,163	0.98	8,983	0.96
Respiratory medical	5,868	5,945	1.01	6,681	7,049	1.06	7,034	1.05
Respiratory surgical	6,492	6,563	1.01	7,103	7,781	1.10	7,793	1.10
Cardiovascular medical	3,781	3,786	1.00	4,502	4,489	1.00	4,483	1.00
Cardiovascular surgical	6,952	7,030	1.01	7,656	8,335	1.09	8,291	1.08
Infection medical	8,736	8,822	1.01	10,276	10,460	1.02	10,478	1.02
Infection surgical	11,706	12,211	1.04	11,915	14,479	1.22	14,617	1.23
Hematology medical	3,521	3,536	1.00	3,915	4,193	1.07	4,212	1.08
Hematology surgical	6,284	6,383	1.02	7,001	7,568	1.08	7,556	1.08
Rehabilitation medical	4,764	4,696	0.99	6,277	5,568	0.89	5,452	0.87
Skin medical	3,683	3,602	0.98	4,253	4,271	1.00	4,311	1.01
Skin surgical	7,644	8,534	1.12	8,207	10,118	1.23	10,057	1.23
Serious mental illness	7,323	7,298	1.00	8,690	8,654	1.00	8,713	1.00
Other medical	4,415	4,412	1.00	5,251	5,232	1.00	5,255	1.00
Other surgical	8,514	8,453	0.99	9,022	10,023	1.11	10,131	1.12
Other (not otherwise grouped)	4,682	4,637	0.99	6,889	5,498	0.80	5,362	0.78
Least frail	2,668	2,681	1.00	3,308	3,178	0.96	3,157	0.95
Most frail	9,645	9,567	0.99	11,188	11,344	1.01	11,394	1.02
Cognitively impaired	6,967	6,962	1.00	8,610	8,255	0.96	8,241	0.96
Severely ill (SOI level =4)	17,740	17,739	1.00	19,625	21,033	1.07	21,586	1.10
Highest acuity	29,593	23,750	0.80	31,705	28,160	0.89	31,551	1.00
Multiple body systems	16,033	16,035	1.00	18,310	19,013	1.04	19,401	1.06
Chronically critically ill (CCI)	14,375	14,445	1.00	15,772	17,128	1.09	17,550	1.11
Region 1	5,154	5,680	1.10	6,238	6,735	1.08	6,627	1.06
Region 2	6,307	6,558	1.04	7,540	7,776	1.03	7,689	1.02
Region 3	6,050	6,306	1.04	7,022	7,477	1.06	7,393	1.05
Region 4	5,296	5,248	0.99	6,367	6,223	0.98	6,235	0.98
Region 5	6,002	6,039	1.01	6,979	7,161	1.03	7,134	1.02
Region 6	4,998	4,656	0.93	5,978	5,521	0.92	5,642	0.94
Region 7	6,783	6,903	1.02	7,695	8,185	1.06	8,145	1.06
Region 8	6,597	6,224	0.94	7,287	7,379	1.01	7,457	1.02
Region 9	5,867	5,885	1.00	7,248	6,978	0.96	6,966	0.96
Region 10	6,298	6,126	0.97	7,007	7,264	1.04	7,312	1.04
HHA therapy share of stay cost=0	1,207	2,198	1.82	1,931	2,606	1.35	2,498	1.29
HHA therapy share of stay cost LE 50%	1,943	2,328	1.20	2,176	2,761	1.27	2,742	1.26
HHA therapy share of stay costs 50-75%	2,951	2,323	0.79	3,066	2,754	0.90	2,840	0.93

Reporting category	Actual cost (\$)	Predicted cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (no outlier policy) (\$)	Ratio of PAC PPS payment to actual 2013 payment	PAC PPS payment with outlier policy (\$)	Ratio PAC PPS with outlier policy to actual 2013 payment
HHA therapy share of stay costs >75%	3,488	2,318	0.66	3,923	2,748	0.70	2,852	0.73
Institutional PAC therapy share of stay costs 0-25%	14,408	15,222	1.06	14,022	18,049	1.29	18,492	1.32
Institutional PAC therapy share of stay costs 25-50%	12,183	12,632	1.04	13,479	14,978	1.11	14,740	1.09
Institutional PAC therapy share of stay costs 50-75%	12,616	12,380	0.98	16,170	14,680	0.91	14,504	0.90
Institutional PAC therapy share of stay costs > 75%	13,144	12,117	0.92	18,045	14,367	0.80	14,338	0.79
SNF shortest 10th percentile	3,022	12,257	4.06	1,069	14,533	13.59	13,807	12.91
IRF shortest 10 percentile	8,503	12,941	1.52	8,972	15,344	1.71	14,580	1.63
LTCH shortest 10th percentile	12,503	23,462	1.88	7,999	27,820	3.48	26,453	3.31
HHA LUPA	772	2,191	2.84	347	2,598	7.49	2,468	7.12
Community admitted	2,850	2,854	1.00	3,558	3,383	0.95	3,393	0.95
Stays with prior hospital stay	8,461	8,457	1.00	9,853	10,028	1.02	10,018	1.02
Disabled	5,517	5,517	1.00	6,479	6,541	1.01	6,594	1.02
Dual eligible	5,572	5,543	0.99	6,792	6,572	0.97	6,614	0.97
ESRD	6,856	6,872	1.00	7,937	8,148	1.03	8,302	1.05
Very old (85+ years old)	5,687	5,678	1.00	6,895	6,733	0.98	6,684	0.97

Source: 2013 Medicare acute hospital and PAC claims, Medicare 2013 risk score file, and Medicare cost reports for 2013.

Note: PAC = postacute care; PPS = prospective payment system; SOI = severity of illness; CCI = chronically critically ill; ESRD = end-stage renal disease; HHA = home health agency; SNF = skilled nursing facility; IRF = inpatient rehabilitation facility; LTCH = long-term care hospital. The illustrative outlier policy set the threshold so that outlier payments would equal 5 percent of total estimated payments for home health providers and 5 percent of total estimated payments for institutional providers. Outlier payments would cover 80 percent of the costs above the fixed-loss threshold. Patients' level of frailty was determined using a frailty index. The table shows the ratios of average payments in 2013 to average costs in 2013 for all the PAC stays included in the group, as well as the ratios of estimated payments under a PAC PPS to average actual costs in 2013 for all the PAC stays in each group. A payment-to-cost ratio of 1.0 indicates that payments equal the actual costs. Estimated payments under a PAC PPS are based on a payment model that uses readily available administrative data such as claims information from PAC stays and preceding hospital stays, demographic information from the Medicare enrollment files, beneficiary risk scores, and cost report information for PAC providers. The payment model combines the results of a model that predicts the costs of routine and therapy combined and one that predicts nontherapy ancillary costs. Multiple body systems include patients with diagnoses involving five or more body systems. CCI stays include patients who spent eight or more days in an intensive care or coronary care unit during the preceding hospital stay or were on a ventilator in the PAC setting. Severely ill stays include patients who were categorized as SOI level 4 during the immediately preceding hospital stay. Highest acuity patients were those categorized as SOI level 4 who received PAC in institutional settings only, were on dialysis, and had severe wounds or pressure ulcers. All LTCHs are included in the freestanding group. LTCH-qualifying stays are those that meet the patient-specific criteria to qualify for LTCH PPS payments.

TABLE 13

Comparison of Actual Costs, Predicted Costs, Actual Payments, and Simulated Payments under a PAC PPS with and without an Illustrative Short Stay Outlier Policy for PAC Stays in 2013

	Actual Cost (\$)	Predicted Cost (\$)	Ratio of predicted to actual cost	Actual payment (2013) (\$)	Payment under PAC PPS (no outlier policy) (\$)	Ratio of PAC PPS payment to actual 2013 payment	PAC PPS payment with outlier policy (\$)	Ratio PAC PPS with outlier policy to actual 2013 payment	Stay count
All	5,653	5,653	1.00	6,703	6,703	1.00	6,703	1.00	8,889,992
SNF shortest 10th percentile	3,022	12,257	4.06	1,069	14,533	13.59	5,344	5.00	229,973
IRF shortest 10 percentile	8,503	12,941	1.52	8,972	15,344	1.71	6,779	0.76	44,847
LTCH shortest 10th percentile	12,503	23,462	1.88	7,999	27,820	3.48	9,062	1.13	14,550
HHA LUPA	772	2,191	2.84	347	2,598	7.49	1,050	3.03	540,432

Source: 2013 Medicare acute hospital and PAC claims, Medicare 2013 risk score file, and Medicare cost reports for 2013.

Note: PAC = postacute care; PPS = prospective payment system; SOI = severity of illness; CCI = chronically critically ill; ESRD = end-stage renal disease; HHA = home health agency; SNF = skilled nursing facility; IRF = inpatient rehabilitation facility; LTCH = long-term care hospital. The illustrative short stay policy paid a per day (or per visit, in the case of HHA episodes) amount based on the average cost per day (or per visit). The day cutoff for SNFs was 6 or fewer days, 7 or fewer days for IRFs, and 11 or fewer days for LTCHs.

Appendix. Fixed-Effects Poisson Model of Routine Costs per Stay

TABLE A.1

Fixed-Effects Poisson Model of Routine Costs per Stay

Predictor	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Age minus fifty (capped at 45)				
Age - 50	-0.009	0.0040	-2.23	0.991
Age -50 squared	0.00015	0.0001	2.01	1.0002
Age less than 50	-0.105	0.0810	-1.29	0.901
Cognitive function				
Coma	0.051	0.1219	0.42	1.052
Dementia with complications (HCC51)	-0.002	0.0700	-0.02	0.998
Dementia without complications (HCC52)	-0.142	0.1778	-0.80	0.868
Schizophrenia (HCC57)	-0.011	0.0733	-0.15	0.989
Major Depressive, Bipolar, and Paranoid Disorders (HCC58)	-0.122	0.1356	-0.90	0.885
Ability to function (JFI index components)				
Minor ambulatory limitations	-0.085	0.0435	-1.95	0.919
Severe ambulatory limitations	-0.007	0.0276	-0.25	0.993
Cognitive developmental disability	0.016	0.0216	0.73	1.016
Chronic mental illness	0.090	0.0559	1.61	1.094
Dementia	-0.019	0.0577	-0.32	0.982
Sensory disorders	-0.052	0.0329	-1.57	0.949
Selfcare impairment	-0.002	0.0185	-0.09	0.998
Syncope	-0.009	0.0248	-0.35	0.991
Cancer	0.081	0.0622	1.30	1.084
Chronic medical disease	0.002	0.0268	0.07	1.002
Pneumonia	-0.029	0.0244	-1.20	0.971
Renal disorders	-0.075	0.0614	-1.23	0.927
Systemic disorders (e.g., septicemia)	0.057	0.0259	2.18	1.058
Primary reason for treatment^a				
Stroke	0.045	0.0456	0.98	1.046
Neurological surgical	0.107	0.0591	1.81	1.113
Neurological medical	-0.017	0.0458	-0.36	0.984
Respiratory trach/vent	0.300	0.1081	2.77	1.349
Respiratory surgical	0.144	0.0664	2.17	1.155
Respiratory medical	0.168	0.0434	3.88	1.183
Chronic obstructive pulmonary disease	0.178	0.0626	2.85	1.195
Cardiovascular vascular surgical	0.177	0.0847	2.09	1.194
Cardiovascular cardiac surgical	0.175	0.0443	3.96	1.192
Cardiovascular general medical	0.149	0.0435	3.42	1.161
Orthopedic minor surgical	0.006	0.0579	0.11	1.006
Orthopedic spinal	0.114	0.0439	2.59	1.120
Orthopedic minor medical	-0.105	0.0511	-2.05	0.900
Orthopedic major medical	0.153	0.0969	1.58	1.166
Skin surgical	0.236	0.0781	3.03	1.267
Skin medical	0.279	0.0646	4.32	1.322
Endocrine surgical	0.135	0.1711	0.79	1.144
Endocrine medical	0.205	0.0585	3.50	1.228
Kidney & urinary surgical	0.009	0.1991	0.04	1.009
Kidney & urinary medical	0.015	0.0551	0.28	1.015
Infections surgical	0.214	0.0705	3.04	1.239
Infections medical	0.253	0.0922	2.75	1.288

Predictor	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Infections septicemia	0.026	0.0916	0.28	1.026
Transplant	0.098	0.2286	0.43	1.102
GI & liver minor surgical	0.223	0.0683	3.26	1.249
GI & liver major surgical	0.439	0.1204	3.65	1.552
GI & liver minor medical	0.213	0.0550	3.88	1.238
GI & liver major medical	0.040	0.0536	0.74	1.040
Hematology surgical	0.050	0.0976	0.51	1.051
Hematology medical	0.208	0.0579	3.59	1.231
Other surgery	0.077	0.0530	1.44	1.080
Other medical	0.210	0.0857	2.45	1.233
Other (not otherwise grouped)	-0.248	0.2627	-0.94	0.780
Vent	0.456	0.0619	7.37	1.578
Comorbidities				
Alcohol or drug disease	0.079	0.0758	1.04	1.082
Cancer	0.007	0.0670	0.1	1.007
Cardiac and Vascular	0.032	0.0225	1.42	1.032
Complications of device or graft	-0.136	0.1036	-1.31	0.873
Dementia	0.044	0.0519	0.86	1.045
Eye disorders	0.327	0.0712	4.6	1.387
GI and liver	0.027	0.0434	0.62	1.027
Head and spine	0.088	0.0464	1.89	1.092
Hematologic + immunologic disease	-0.004	0.0380	-0.1	0.996
HIV/AIDS	-0.075	0.1325	-0.56	0.928
Mental illness	0.107	0.1001	1.07	1.113
Metabolic endocrine	0.049	0.0246	1.99	1.050
Neuro excluding stroke	0.006	0.0401	0.15	1.006
Obesity	-0.106	0.0801	-1.32	0.900
Orthopedic	0.047	0.0374	1.25	1.048
Renal	0.074	0.0603	1.23	1.077
Respirator dependence	0.099	0.0601	1.65	1.104
Respiratory	0.048	0.0298	1.59	1.049
Septicemia + Other systemic infection	0.128	0.0647	1.98	1.136
Skin disorders	0.099	0.0422	2.34	1.104
Stroke	0.124	0.0454	2.72	1.132
Transplant	-0.064	0.0844	-0.76	0.938
Treatments and impairments				
Bowel incontinence	0.141	0.0772	1.83	1.152
CPAP	-0.074	0.0665	-1.11	0.929
Swallowing	0.033	0.0312	1.04	1.033
Risk score	0.014	0.0064	2.16	1.014
Total number of ICU and CCU days (capped)	0.002	0.0024	0.72	1.002
Severity level				
Zero	0.142	0.0907	1.57	1.153
Two	0.025	0.0342	0.74	1.026
Three	0.004	0.0363	0.1	1.004
Four	-0.018	0.0561	-0.31	0.983
Wound care				
Pressure ulcer, stage III	-0.142	0.1208	-1.18	0.867
Pressure ulcer, stage IV	-0.209	0.0916	-2.28	0.812
Pressure ulcer, unstageable	0.076	0.0976	0.78	1.079
Wound with morbid obesity	-0.222	0.0999	-2.22	0.801
Severe wound	0.164	0.0961	1.71	1.179
Osteomyelitis	-0.166	0.1101	-1.5	0.847
Fistula	0.953	0.1763	5.41	2.593
Infected wound	0.124	0.1327	0.94	1.132
Nursing home surgical wound	0.082	0.1164	0.71	1.086
Number of body systems \geq 5	-0.163	0.0595	-2.74	0.850
Disabled	-0.008	0.0284	-0.27	0.992

Predictor	Coefficient	Cluster robust standard error	t-statistic	Exp(coef)
Home health times # visits	0.046	0.0026	17.77	1.047
Home health times # visits squared	-0.00020	0.0000	-6.57	0.9998
Institutional patient times length of stay	0.052	0.0044	11.7	1.053
Institutional patient times length of stay squared	-0.00026	0.0000	-5.81	0.9997
N	6,407			

Notes: JFI = Jen Frailty Index; HCC=hierarchical condition category. The Poisson regression was weighted by setting. Standard errors are clustered by provider. Model includes an indicator for each provider.

^a Orthopedic major surgery is the omitted group.

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