



Report to Congress: Unified Payment for Medicare-Covered Post-Acute Care

Analysis and development of the prototype Unified PAC
prospective payment system called for in the IMPACT Act

Appendix N

Dictionary of Analyses and Results

July 2022

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Analysis	Purpose	Output/Product	Model Specification	Dependent Variable	Independent Variables	Unit of Analysis	Exclusions	Notes
Part 1 - Initial Sample Selection								
1.1	Examine data and flag exclusions	Exclusion flags	Descriptive	Total claim cost	UCPG, PAC setting type, decedent flag, length of stay, LUPA flag, transfer flag, dates of service	PAC Stay	None	None
Part 2 - Create PAC Case-Mix Groups (P-CMG)								
2.1	PAC setting adjustment to create dependent variable for CART	Setting-adjusted cost, created by dividing cost by UCPG-specific setting effect	GLM with Log Link function and gamma distribution. Separate models for each UCPG.	Total claim cost	Motor function score, bowel and bladder incontinence flags, age groups, cognitive function score, community entrant flag, prior PAC stay flag	PAC Stay	Exclusions flagged in 1.1	Independent variables other than Motor Function in this section were originally intended to be included in CART but were later removed because they showed up infrequently in results. Bowel/bladder and cognitive function were added to comorbidity list (see 3.2). Others were dropped. All were kept in this model to minimize the degree to which setting effect might inadvertently capture other factors.
2.2	CART Analyses for P-CMG assignment rules	P-CMG assignment rules	CART. Separate models for each UCPG, year, and version of motor function score.	Setting-adjusted cost created in 2.1	Motor function score	PAC Stay	Exclusions flagged in 1.1	For the purposes of the prototype, results from the various models were synthesized into a single set of P-CMG assignment rules based on trends observed and clinical/analyst judgment. P-CMGs for Medical UCPGs were based on primary diagnosis, where applicable. Separate P-CMGs were created for special populations of Short-Stays, Decedents, and Cost-Outliers (i.e., exclusions flagged in 1.1).
Part 3 - Create Comorbidity Groups								
3.1	CCSR Secondary Diagnosis Regressions	Cost coefficients for AHRQ CSRs generated based on PAC claim secondary diagnoses	OLS regression with no constant. Separate models for each UCPG. Dummy variables for each P-CMG in each UCG.	Total claim cost	Full list of AHRQ CSRs, and P-CMG.	PAC Stay	P-CMGs for Short Stays, Decedents, and Cost-Outliers	The purpose of this initial run is to better understand which CSRs can be dropped or combined based on frequency and ability to predict cost, in addition to clinical judgment.
3.2	Comorbidity Group Regression	Cost coefficients and comorbidity tier assignments	OLS regression with no constant. Separate models for each UCPG. Dummy variables for each P-CMG in each UCG.	Total claim cost	Comorbidity list, after combining or dropping CSRs based on results from 3.1, and P-CMG intercepts.	PAC Stay	P-CMGs for Short Stays, Decedents, and Cost-Outliers	This second run uses the final list of comorbidities created based on the output from 3.1. Based on the model coefficients, each comorbidity is sorted into one of four 'tiers' based on relative costliness within the UCPG. 0 = No cases, zero, or negative coefficient; 1 = Coefficient greater than zero up to the median within UCPG; 2 = Coefficient between the median and 90th percentile within UCPG; and 3 = coefficient greater than the 90th percentile. Using three years of data, the highest tier assignment for each combination of UCPG, comorbidity, and year was used in the final list.
3.3	Comorbidity Index (CI) calculation and Comorbidity Group Assignment	PAC Stay Comorbidity Group Assignment	Descriptive	N/A	N/A	PAC Stay	P-CMGs for Short Stays, Decedents, and Cost-Outliers	The CI is calculated by summing the tier values associated with each of the comorbidities that appears on the claim for the PAC stay. We then examined the distribution of CIs across PAC stays within each UCPG and divided them into quintiles. These quintiles serve as the Comorbidity Groups.

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Part 4 - Calculate Payment Weights								
4.1	Create "Adjusted Cost" for final payment weight calculation.	"Adjusted Cost" is adjusted by Comorbidity Group adjustment factors, PAC setting adjustment factors, rural adjustment factors, all UCPG specific. This serves as the dependent variable for estimating payment weights.	GLM with Log Link function and gamma distribution. Separate models for each UCPG.	Total claim cost	P-CMG, Comorbidity Group, PAC setting type, rural setting indicator.	PAC Stay	Cost outliers	"Adjusted cost" is created by dividing total claim cost by the UCPG-specific Comorbidity Group, PAC setting, and rural adjustment factors corresponding to the PAC stay. This serves as the cost value used to estimate base payment weights for each combination of UCPG and P-CMG. Note that short stays and decedents receive PAC setting and rural adjustments, but NOT Comorbidity Group adjustments, as they are all assigned to the baseline Comorbidity Group #1. "Short transfers," defined as a PAC stay ending in a transfer to an institutional PAC setting with LOS below the average for the UCPG, P-CMG, and PAC setting type, receive reduced weight in the calculation proportional to their length of stay.
4.2	Estimate payment weights	Base payment weights for each combination of UCPG and P-CMG. Final payment weights.	Calculation of relative weight. (Average Cost)/(Overall Average Cost).	Adjusted cost created in 4.1	N/A	PAC Stay	Cost outliers	Average "adjusted cost" across PAC stays assigned to the combination of UCPG and P-CMG is divided by the average "adjusted cost" across all PAC stays in the data. This produces the Base Payment Weight. The Base Payment Weights are multiplied by the Comorbidity Group, PAC setting, and rural adjustment factors that were divided out to create "adjusted cost" in 4.1. This creates the Final Payment Weight. Final Payment Weights are then rescaled to 1 by dividing by the overall average payment weight. "Short transfers," defined as a PAC stay ending in a transfer to an institutional PAC setting with LOS below the average for the UCPG, P-CMG, and PAC setting type, receive reduced weight in the calculation proportional to their length of stay.
4.3	Model fit regressions	Model fit statistic (R2) for key groups of beneficiaries and PAC provider types.	OLS regression.	Total claim cost	UCPG, P-CMG, Comorbidity Group, PAC setting type, rural indicator. UCPG interacted with each of the other independent variables.	PAC Stay	Cost outliers	Model structure is intended to simulate the payment weight calculation to determine the percent of the variation in costs accounted for by the model. Key sub-groups include PAC Provider types, UCPGs, facility size, and census region. "Short transfers," defined as a PAC stay ending in a transfer to an institutional PAC setting with LOS below the average for the UCPG, P-CMG, and PAC setting type, receive reduced weight in the calculation proportional to their length of stay.
4.4	Model predictions and impacts	Payment to Cost Ratios and Impact Ratios across key groups of PAC providers and beneficiaries	Descriptive	Total claim cost Total allowed charges	Model payment weights	PAC Stay	Cost outliers	Key groups of PAC providers include PAC setting type, facility bed size (excludes HHA), Urban vs. Rural CBSA, and US Census Region. Key groups of beneficiaries include UCPGs and deciles of payment weight.

Result/Value	Description/Purpose	Model/ Analysis	Interpretation of Statistic	Numerator (if applicable)	Denominator (if applicable)	Unit of Analysis	Exclusions	Notes
Base Payment Weight	Baseline payment weight value assigned to each combination of UPCG and P-CMG.	4.2	Relative costliness of the PAC stays assigned to each UPCG and P-CMG combination independent of Comorbidity Group, PAC Setting, and Rural Location.	N/A	N/A	Unique combinations of UPCG and P-CMG. Corresponding value assigned to all PAC stays.	Cost outliers	The dependent variable used to calculate this value is "Adjusted Cost" calculated in 4.1.
Comorbidity Group Adjustment Factor	Multiplier assigned to Comorbidity Groups 2-5 in each UPCG (relative to Group 1).	4.1	Relative costliness of being in Comorbidity Groups 2 through 5 relative to Group 1 in each UPCG holding P-CMG, PAC Setting, and Rural Location constant.	N/A	N/A	Unique combinations of UPCG and Comorbidity Group. Corresponding value assigned to all PAC stays.	Cost outliers	This value is divided out of "Total Cost" in 4.1 to create "Adjusted Cost," which serves as dependent variable in 4.2. It is also multiplied by the base payment weight created in 4.2 to create the Final Payment Weight.
PAC Setting Adjustment Factor	Multiplier assigned to PAC Settings in each UPCG.	4.1	Relative costliness of being in SNF, HHA, LTCH, or LTCH-SN relative to IRF in each UPCG holding P-CMG, Comorbidity Group, and Rural Location constant.	N/A	N/A	Unique combinations of UPCG and PAC Setting. Corresponding value assigned to all PAC stays.	Cost outliers	This value is divided out of "Total Cost" in 4.1 to create "Adjusted Cost," which serves as dependent variable in 4.2. It is also multiplied by the base payment weight created in 4.2 to create the Final Payment Weight.
Rural Area Adjustment Factor	Multiplier assigned to PAC stays occurring in Rural Areas in each UPCG.	4.1	Relative costliness of a PAC stay being in a Rural Area in each UPCG holding P-CMG, Comorbidity Group, and PAC setting constant.	N/A	N/A	Unique combinations of UPCG and Rural indicator. Corresponding value assigned to all PAC stays.	Cost outliers	This value is divided out of "Total Cost" in 4.1 to create "Adjusted Cost," which serves as dependent variable in 4.2. It is also multiplied by the base payment weight created in 4.2 to create the Final Payment Weight.

Result/Value	Description/Purpose	Model/ Analysis	Interpretation of Statistic	Numerator (if applicable)	Denominator (if applicable)	Unit of Analysis	Exclusions	Notes
Final Payment Weight	Final payment weight value assigned to each combination of UPCG, P-CMG, Comorbidity Group, PAC setting type, and Rural vs. Urban area.	4.2	Relative costliness of the PAC stays assigned to each combination of UPCG, P-CMG, Comorbidity Group, PAC Setting, and Rural vs. Urban area.	N/A	N/A	Unique combination of UPCG, P-CMG, Comorbidity Group, PAC setting, and Rural indicators.	Cost outliers	This value is calculated by taking the Base Payment Weights and multiplying them by the Comorbidity, PAC Setting, and Rural adjustment factors corresponding to the PAC stay.
Payment to Cost Ratio	Indicates whether the model over-predicts or under-predicts costs of care across key groups of PAC providers and beneficiaries.	4.4	Ratio of the average payment weight generated by the prototype to the average total cost across key groups of PAC providers and beneficiaries.	Average payment weight generated by the Prototype Unified PAC PPS across PAC stays included in the group.	Average total cost of the PAC stays included in the group, rescaled to 1 by dividing by the overall average across all PAC stays.	PAC stays in the group of interest.	Cost outliers	Key groups of PAC providers include PAC setting type, facility bed size (excludes HHA), Urban vs. Rural CBSA, and US Census Region. Key groups of beneficiaries include UPCGs and deciles of payment weight.
Impact Ratio	Indicates whether the payments made based on the Unified PAC PPS would increase or decrease relative to payments under the existing PAC payment systems.	4.4	Ratio of the average payment weight generated by the prototype to the average PAC claim allowed charges across key groups of PAC providers and beneficiaries.	Average payment weight generated by the Prototype Unified PAC PPS across PAC stays included in the group. (Adjusted with wage index, see notes)	Average total allowed charges of the PAC stays included in the group, rescaled to 1 by dividing by the overall average across all PAC stays.	PAC stays in the group of interest.	Cost outliers	Key groups of PAC providers include PAC setting type, facility bed size (excludes HHA), Urban vs. Rural CBSA, and US Census Region. Key groups of beneficiaries include UPCGs and deciles of payment weight. Labor share of Final Payment Weights adjusted using corresponding area wage index to compare with Allowed Charges.
Model Fit (R2)	Proportion of variation in total costs of the PAC stay explained (predicted) by the prototype Unified PAC PPS.	4.3	Model fit statistic generated by linear regression model specified to align with the structure of the prototype.	N/A	N/A	PAC stays in the group of interest.	Cost outliers	See 4.3 for model specification.

Result/Value	Description/Purpose	Model/Analysis	Interpretation of Statistic	Numerator (if applicable)	Denominator (if applicable)	Unit of Analysis	Exclusions	Notes
Payment to Cost Ratio (2020 Analysis)	Indicates whether the model over-predicts or under-predicts costs of care in 2020 using payment weights based on data from 2017 to 2019 across key groups of PAC providers and beneficiaries.	4.4	Ratio of the average payment weight generated by the prototype calibrated on data from 2017 to 2019 to the average total cost across key groups of PAC providers and beneficiaries in 2020.	Average payment weight generated by the Prototype Unified PAC PPS calibrated using data from 2017 to 2019 across PAC stays included in the group.	Average total cost of the PAC stays included in the group in 2020, rescaled to 1 by dividing by the overall average across all PAC stays.	PAC stays in the group of interest.	Cost outliers	Analysis intended as a "stress test" of the prototype under extraordinary circumstances such as 2020. Key groups of PAC providers include PAC setting type, facility bed size (excludes HHA), Urban vs. Rural CBSA, and US Census Region. Key groups of beneficiaries include UPCGs and deciles of payment weight.