



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 E

CART Analysis Results

July 2022

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Table E-1. CART Analysis Results by Year and Version of Motor Function Score

Unified PAC Clinical Group (UPCG)	Motor Function Version 1-1 (Range 0-27)											
	2017			2018			2019			2020		
	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2
MMTA: Cardiac	0.015	11		0.018	11		0.014	11		0.009	11	
MMTA: Endocrine	0.017	14					0.016	11				
MMTA: Gastrointestinal/Genitourinary	0.019	11		0.016	10		0.015	11				
MMTA: Infections	0.015	14										
MMTA: Respiratory	0.014	11		0.016	11		0.012	14				
MMTA: Surgical Aftercare	0.016	11		0.016	11		0.013	11		0.011	9	
MMTA: Other												
Lower Extremity Fracture (Including with Joint Replacement)	0.032	10		0.031	10		0.034	10		0.024	9	
Major Joint Replacement Without Lower Extremity Fracture	0.040	11	9	0.039	11	9	0.040	11	8	0.023	9	
Orthopedic Surgery (Not Joint Replacement)	0.040	10	8	0.042	10	9	0.039	10	9	0.029	9	
Trauma	0.027	9		0.026	10		0.024	9				
Limb Loss				0.020	11							
Orthopedic (Other)	0.030	11	9	0.034	11	9	0.033	9	11	0.027	9	11
Stroke	0.081	9	11	0.081	9	11	0.075	9	11	0.052	9	11
Non-Traumatic Brain Dysfunction	0.098	9	11	0.096	9		0.112	9	5	0.084	8	
Spinal Dysfunction												
Traumatic Brain Injury	0.054	9		0.056	9		0.053	8		0.045	9	
Neurological (Other)	0.028	10	9	0.032	10	14	0.033	11	9	0.017	10	
Respiratory	0.034	11	9	0.035	11	9	0.036	11	9	0.020	11	
Cardiovascular	0.039	11	9	0.039	11	9	0.038	11	9	0.018	11	
Behavioral Health												
Coma												
Invasive Ventilator	0.050	8		0.046	8		0.037	8		0.046	8	
Gastrointestinal & Hepatobiliary	0.035	11		0.038	11		0.034	11		0.026	11	
Infections	0.021	11		0.022	11		0.020	11		0.016	11	
Kidney & Urinary	0.019	11		0.022	11		0.021	11		0.015	11	
Skin	0.017	11		0.018	11		0.014	11				
Cancer	0.021	11		0.023	11		0.020	11				
Transplant												
Hematological				0.029	11							
Other	0.038	11	9	0.040	11	9	0.045	11	9	0.029	11	
COVID-19										0.013	14	

See notes for specifications of each version of the Motor Function score.

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Table E-1. CART Analysis Results by Year and Version of Motor Function Score (continued)

Unified PAC Clinical Group (UPCG)	Motor Function Version 2-1 (Range 0-27)											
	2017			2018			2019			2020		
	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2
MMTA: Cardiac	0.015	11		0.018	11		0.014	11		0.009	11	
MMTA: Endocrine	0.015	15					0.016	10				
MMTA: Gastrointestinal/Genitourinary	0.019	11		0.016	10		0.016	11				
MMTA: Infections	0.015	14										
MMTA: Respiratory	0.015	11		0.016	11		0.012	14				
MMTA: Surgical Aftercare	0.016	11		0.016	11		0.013	11				
MMTA: Other												
Lower Extremity Fracture (Including with Joint Replacement)	0.029	11		0.027	11		0.030	10		0.019	9	
Major Joint Replacement Without Lower Extremity Fracture	0.025	11		0.026	11		0.024	11		0.018	9	
Orthopedic Surgery (Not Joint Replacement)	0.038	11	9	0.039	9	11	0.035	11	9	0.024	9	
Trauma	0.023	11		0.024	10		0.020	10				
Limb Loss												
Orthopedic (Other)	0.026	11	9	0.030	11	9	0.029	11	8	0.022	9	11
Stroke	0.071	10	9	0.071	10	9	0.067	10	9	0.047	9	11
Non-Traumatic Brain Dysfunction	0.091	9	11	0.103	9	11	0.105	9	11	0.083	9	
Spinal Dysfunction												
Traumatic Brain Injury	0.051	10		0.051	9		0.046	8		0.034	9	
Neurological (Other)	0.023	11		0.026	11		0.024	11		0.016	11	
Respiratory	0.031	11	15	0.031	11	15	0.027	11		0.017	11	
Cardiovascular	0.033	11	15	0.032	11	9	0.032	11	14	0.013	13	
Behavioral Health												
Coma												
Invasive Ventilator	0.042	10		0.041	9		0.035	9		0.040	9	
Gastrointestinal & Hepatobiliary	0.029	11		0.032	11		0.028	11		0.021	10	
Infections	0.015	11		0.018	11		0.014	12		0.011	11	
Kidney & Urinary	0.015	12		0.020	11		0.018	11		0.012	12	
Skin	0.016	11		0.018	11		0.013	11				
Cancer	0.017	11		0.021	11		0.019	11				
Transplant												
Hematological												
Other	0.033	11	14	0.033	11	15	0.036	11	9	0.023	11	
COVID-19										0.012	15	

See notes for specifications of each version of the Motor Function score.

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Table E-1. CART Analysis Results by Year and Version of Motor Function Score (continued)

Unified PAC Clinical Group (UPCG)	Motor Function Version 1-2 (Range 0-27)						Motor Function Version 2-2 (Range 0-27)					
	2019			2020			2019			2020		
	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2	Model Fit (R2)	Split 1	Split 2
MMTA: Cardiac	0.011	13					0.010	14				
MMTA: Endocrine												
MMTA: Gastrointestinal/Genitourinary												
MMTA: Infections												
MMTA: Respiratory	0.012	15					0.012	15				
MMTA: Surgical Aftercare	0.010	12					0.008	14				
MMTA: Other												
Lower Extremity Fracture (Including with Joint Replacement)	0.031	10		0.023	10		0.029	11		0.018	11	
Major Joint Replacement Without Lower Extremity Fracture	0.047	9	11	0.042	9	11	0.044	9	12	0.032	9	
Orthopedic Surgery (Not Joint Replacement)	0.040	10	13	0.031	10		0.034	10	13	0.032	9	11
Trauma	0.024	9					0.020	9				
Limb Loss												
Orthopedic (Other)	0.038	11	9	0.034	11	9	0.033	11	9	0.029	11	9
Stroke	0.077	9	11	0.055	9	11	0.067	10	9	0.049	9	12
Non-Traumatic Brain Dysfunction	0.121	9	5	0.103	9	7	0.115	9	11	0.085	9	
Spinal Dysfunction												
Traumatic Brain Injury	0.051	8		0.046	9		0.052	9		0.039	9	
Neurological (Other)	0.033	11	9	0.018	10		0.028	11	9	0.015	11	
Respiratory	0.036	11	9	0.020	11		0.027	11		0.017	11	
Cardiovascular	0.038	11	9	0.019	11		0.033	11	14	0.013	12	
Behavioral Health												
Coma												
Invasive Ventilator	0.037	8		0.046	8		0.035	9		0.040	9	
Gastrointestinal & Hepatobiliary	0.034	11		0.026	11		0.028	11		0.022	10	
Infections	0.020	11		0.016	11		0.015	12		0.012	11	
Kidney & Urinary	0.021	11		0.015	11		0.018	11		0.011	12	
Skin	0.011	11					0.009	13				
Cancer	0.018	11					0.019	11				
Transplant												
Hematological												
Other	0.045	11	9	0.030	11		0.034	11	15	0.024	11	
COVID-19				0.012	14					0.012	16	

See notes for specifications of each version of the Motor Function score.

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Table E-1. CART Analysis Results by Year and Version of Motor Function Score (continued)

Unified PAC Clinical Group (UPCG)	Motor Function Version 3-1 (Range 9-54)						
	2019			2020			
	Model Fit (R2)	Split 1	Split 2	Split 3	Model Fit (R2)	Split 1	Split 2
MMTA: Cardiac	0.015	36			0.011	35	
MMTA: Endocrine	0.016	38					
MMTA: Gastrointestinal/Genitourinary	0.017	37					
MMTA: Infections							
MMTA: Respiratory	0.015	36					
MMTA: Surgical Aftercare	0.014	35			0.012	31	
MMTA: Other							
Lower Extremity Fracture (Including with Joint Replacement)	0.050	28			0.041	27	
Major Joint Replacement Without Lower Extremity Fracture	0.081	29	36	23	0.066	27	33
Orthopedic Surgery (Not Joint Replacement)	0.071	27	32		0.053	27	
Trauma	0.036	28			0.026	28	
Limb Loss	0.030	30			0.025	31	
Orthopedic (Other)	0.052	29	36		0.047	30	24
Stroke	0.091	28	34		0.066	29	24
Non-Traumatic Brain Dysfunction	0.129	27	16		0.114	26	31
Spinal Dysfunction							
Traumatic Brain Injury	0.062	29			0.052	27	
Neurological (Other)	0.041	30	36		0.026	30	
Respiratory	0.041	31			0.025	31	
Cardiovascular	0.052	31	27		0.029	33	
Behavioral Health							
Coma							
Invasive Ventilator	0.044	24			0.050	22	
Gastrointestinal & Hepatobiliary	0.049	31			0.038	32	
Infections	0.029	32			0.021	33	
Kidney & Urinary	0.029	33			0.022	32	
Skin	0.018	32					
Cancer	0.032	33					
Transplant							
Hematological	0.037	31			0.030	32	
Other	0.055	31	37		0.042	31	
COVID-19					0.013	36	

See notes for specifications of each version of the Motor Function score.

Table E-1. CART Analysis Results by Year and Version of Motor Function Score (continued)

Unified PAC Clinical Group (UPCG)	Motor Function Version 3-2 (Range 9-54)						
	2019			2020			
	Model Fit (R2)	Split 1	Split 2	Split 3	Model Fit (R2)	Split 1	Split 2
MMTA: Cardiac	0.015	36			0.011	35	
MMTA: Endocrine	0.016	38					
MMTA: Gastrointestinal/Genitourinary	0.017	38					
MMTA: Infections							
MMTA: Respiratory	0.015	36					
MMTA: Surgical Aftercare	0.015	38			0.012	36	
MMTA: Other							
Lower Extremity Fracture (Including with Joint Replacement)	0.050	29			0.040	28	
Major Joint Replacement Without Lower Extremity Fracture	0.080	29	34	24	0.063	27	33
Orthopedic Surgery (Not Joint Replacement)	0.067	29	25		0.051	28	
Trauma	0.034	29			0.025	28	
Limb Loss	0.027	29			0.023	32	
Orthopedic (Other)	0.051	30	36		0.046	30	36
Stroke	0.090	29	34		0.065	29	34
Non-Traumatic Brain Dysfunction	0.143	27	36	17	0.111	27	31
Spinal Dysfunction							
Traumatic Brain Injury	0.063	28			0.051	30	
Neurological (Other)	0.041	30	36		0.026	31	
Respiratory	0.042	31			0.026	31	
Cardiovascular	0.051	31	37		0.029	33	
Behavioral Health							
Coma							
Invasive Ventilator	0.043	25			0.046	23	
Gastrointestinal & Hepatobiliary	0.048	31			0.039	32	
Infections	0.028	32			0.022	34	
Kidney & Urinary	0.031	32			0.023	32	
Skin	0.019	32					
Cancer	0.030	33					
Transplant							
Hematological	0.032	31					
Other	0.056	31	37		0.042	32	
COVID-19					0.013	36	

See notes for specifications of each version of the Motor Function score.

Notes:

- 1) CART = Classification and Regression Tree, PAC = Post-Acute Care, = Medication Management, Teaching, and Assessment.
- 2) Unit of payment (i.e., unit of analysis for calibration of payment weights) is the PAC "stay." A stay may span more than one PAC claim.
- 3) Analyses include all PAC Claims from a 50% random sample of PAC users within each year. Independent samples drawn from each year.
- 4) HHA claims aggregated to "stays" defined as sequences of HHA episodes representing a continuous course of care. Stays beginning with a recertification (indicating the sequence has additional claims in the prior year) were dropped.
- 5) LTCH stays include both stays paid under the LTCH PPS and under the site-neutral LTCH payment policy.
- 6) "Short stays," defined as length of stay of 3 calendar days or fewer for IRF, SNF, and LTCH, and 4 visits or fewer for HHA, were excluded from these statistics.
- 7) "Decedents," defined as the beneficiary being deceased upon discharge from the PAC stay, were excluded from these statistics.
- 8) Cost outliers (PAC stay total cost >3 SD from the mean within UPCG, P-CMG, and PAC Provider Type), were excluded from these statistics.
- 9) Total cost of the PAC stay is adjusted to account for geographic variation in wages using the CMS wage-index and labor share for each geographic area and PAC setting
- 10) Dependent variable of CART analyses adjusted for PAC setting using generalized linear model with log link function and gamma distribution to estimate PAC setting effect. GLM regressions were UPCG-specific and controls for corresponding motor function score, bowel and bladder incontinence, beneficiary age, cognitive impairment, and prior acute and post-acute care. Dependent variable calculated by dividing total cost of the PAC stay by the PAC setting effect corresponding to the stay.
- 11) Initial CART models specified using complexity parameter of 0.001 and a minimum node size of 1,000.
- 12) Model fit (R2) calculated as 1 - cross-validated error from the CART model.
- 13) Final CART results pruned using the 1-SE methodology.
- 14) CART analyses presented for six distinct versions of the Motor Function score across four years of data.
 - a) Version 1-1 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" to 1 (Dependent). OASIS-specific items were mapped to corresponding standardized items to allow for calculation of the motor function score in all years (see report). The final score ranges from 0 to 27.
 - b) Version 1-2 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" based upon results of Rasch analysis (see report). OASIS-specific items were mapped to corresponding standardized items to allow for calculation of the motor function score in all years (see report). The final score ranges
 - c) Version 2-1 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" to 1 (Dependent). Standardized items were used across all settings--therefore, analyses could only be conducted using data from 2019 and 2020 when items were available in HHA. The final score ranges from 0 to 27, which mirrors the scale used when mapping OASIS-specific items to standardized items.
 - d) Version 2-2 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" based upon results of Rasch analysis (see report). Standardized items were used across all settings--therefore, analyses could only be conducted using data from 2019 and 2020 when items were available in HHA. The final score ranges from 0 to 27, which mirrors the scale used when mapping OASIS-specific items to standardized items.
 - e) Version 3-1 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" to 1 (Dependent). Standardized items were used across all settings--therefore, analyses could only be conducted using data from 2019 and 2020 when items were available in HHA. The final score ranges from 9 to 54, which represents the full range of possible responses to the standardized motor function data elements.
 - f) Version 3-2 recodes motor items in the motor function scale missing a response or coded as "Activity not Attempted" based upon results of Rasch analysis (see report). Standardized items were used across all settings--therefore, analyses could only be conducted using data from 2019 and 2020 when items were available in HHA. The final score ranges from 9 to 54, which represents the full range of possible responses to the standardized motor function data elements.

Source: RTI International Analysis of Medicare Claims and Administrative Data – 2017 to 2020

RTI Program Reference: UPAC_BS0020