Calculating Episode-Level Predicted Values for Total Normalized Composite (TNC) Change Measures

The Centers for Medicare & Medicaid Services (CMS) expanded Home Health Value-Based Purchasing (HHVBP) Model uses prediction models to allow for meaningful comparisons of quality measure performance between home health agencies (HHAs) with different case mix profiles. Prediction models incorporate information on each patient's underlying health conditions, functional status, and other characteristics to produce predicted measure value outcomes for each quality episode.

This resource provides an overview of episode-level **predicted value** calculations for the Total Normalized Composite (TNC) Change measures, TNC Self-Care and TNC Mobility, with illustrative examples to show how risk adjustment impacts predicted measure values.

Risk Adjustment[1]

The TNC Change measures shown in expanded HHVBP Model performance reports are risk-adjusted at the HHA level to account for differences in patient clinical characteristics and functional status using the following formula:

(Observed Value – Predicted Value) + National Predicted Value = Risk-Adjusted Value[2]

Observed Value and **Predicted Value** are HHA averages across quality episodes.

Calculating Episode-Level Predicted Values

For the TNC Change measures, CMS calculates the episode-level **predicted value** (measure score) **= X:**

$$X = B_0 + B_1 {*}COV_1 + B_2 {*}COV_2 + B_3 {*}COV_3 + ... B_N {*}COV_N$$

B_0 is the prediction model constant, B_1 is the coefficient for the first covariate, COV_1 is the episode-level value for the first covariate, B_2 is the coefficient for the second covariate, and COV_2 is the episode-level value for the second covariate, etc. TNC Self-Care and TNC Mobility each have their own prediction model.

Covariates, or groups of covariates, represent **risk factors**. For TNC Change measures, all covariates are coded either zero (0) indicating that the risk factor is not present or one (1) indicating that the risk factor is present.

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[1] See the Expanded HHVBP Model webpage for additional information and technical specifications on risk adjustment and prediction models for the expanded HHVBP Model measures.

[2] Risk-adjusted measure values are used in expanded HHVBP Model performance reports.

Quality Episodes Included in TNC Change Measure Calculations

The calculations for TNC Change measures are based on eligible home health episodes for patients covered by Medicare fee-for-service (FFS), Medicare Advantage, or Medicaid (FFS or managed care), ending with a discharge from the agency (OASIS M0100 = 9) during the reporting period. Episodes are excluded from TNC Change measure calculations if any of the following apply:

- Payer is not Medicare or Medicaid
- Patient age less than 18 years
- Patient receiving only pre/post partum or personal care
- Patient is non-responsive at start of care

For episodes ending on or after 1/1/2023, TNC Change measure calculations exclude OASIS M2420 = 3 (patient transferred to a non-institutional hospice).

Examples of episodes that are not included in TNC Change measure calculations:
- Episodes ending in death
- Episodes ending in inpatient transfer
- Episodes ending in nursing home transfer
- Episodes ending in transfer to hospice

For more information on measure exclusions, please visit the CMS Home Health Quality Measures webpage.

April 2023 Technical Specifications and prediction models are used in the following examples. Risk profile data are simulated (not actual patient data).

TNC Change measure values shown in expanded HHVBP Model performance reports are risk-adjusted based on an HHA's average observed and predicted measure values, and the national average predicted measure values. For information about risk models and risk adjustment methods, see the Expanded HHVBP Model webpage.

Have Questions?

As the TNC measures are unique to the expanded HHVBP Model and not used in the Home Health Quality Reporting Program (HH QRP), please direct questions regarding these measures to the HHVBP Help Desk, HHVBPquestions@lewin.com. Please include the following information:

- Your first and last name
- Email address
- CCN(s) or Facility ID (do not include Taxpayer Identification Number (TIN))
- Facility/agency name and address
- If CCN or Facility ID is unknown, please include facility/agency name and zip code

Sample Patient Risk Profile[3]

Risk factors include Hierarchical Condition Categories (HCC) and other patient characteristics associated with TNC Change measure outcomes. The following examples use this fictional **Sample Patient Risk Profile** (with zero (0) HCC risk).

Risk Factor #	Risk Factor	Sample Patient	TNC Change in Mobility		TNC Change in Self Care	
			Covariate	Coefficient	Covariate	Coefficient
1	Age	76	5	-0.0160	5	-0.0265
2	Gender	Female	*		*	
3	Payment source	Medicare fee-for-service	*		*	
4	SOC/ROC and Admission Source	Community	15	-0.0848	15	-0.2057
5	Post-acute facility admission source	No post-acute	*		*	
6	Risk of Hospitalization	5 or more medications				
		Reports exhaustion	23	0.0140	23	0.0385
7	Availability of Assistance	Regular daytime assistance	26	-0.0461	26	-0.1510
		Lives alone	28	0.0277	28	0.1148
8	Pressure Ulcers	No pressure ulcer	*		*	
9	Stasis Ulcer	No stasis ulcer	*		*	
10	Surgical Wound	No surgical wound	*		*	
11	Dyspnea	When walking more than 20 feet, climbing stairs	36	0.0452	36	0.1044
12	Urinary Status	Incontinent	39	-0.0627	39	-0.1551
13	Bowel Incontinence	Very rarely or never	*		*	
14	Cognitive function	Alert/oriented, able to focus and shift attention, comprehends and recalls tasks	*		*	
15	Confusion	Never	*		*	
16	Anxiety	None of the time	*		*	
17	Patient Mood Screening	No symptoms	*		*	
18	Behavioral Symptoms	None	56	0.0375	56	0.0822
19	Disruptive Behavior Frequency	Never	*		*	
20	Grooming	[1] if grooming utensils placed	63	0.0025	64	0.2751
21	Upper Body Dressing	[1] if clothing laid out or handed to patient			67	0.2729
22	Lower Body Dressing	[1] if clothing/shoes laid out or handed to patient	66	0.0144	70	0.2756
23	Bathing	[2] with intermittent assistance	70	0.0023	74	0.2830
24	Toilet Transferring	[1] when reminded/supervised	75	0.2322	79	0.0143
25	Toilet Hygiene	[1] if supplies/implements laid out for patient	78	-0.0071	82	0.2731
26	Transferring	[1] minimal assistance/device	81	0.1279	85	-0.0262
27	Ambulation	[1] independent, with the use of one-handed device	84	0.1334	88	0.0135
28	Feeding or Eating	[1] able to feed independently, requires set-up or assistance or diet	88	-0.0124	92	0.1082
29	Oral Medication Management	[1] at correct times if individual dosages or diary/chart prepared	91	0.0203	95	0.0313
30	Supervision and Safety Assistance	Caregiver(s) need training to provide assistance	95	-0.0065	99	-0.0253
_CON	CONSTANT		149	0.0395	148	0.1991
Predicted Episode Measure Value (sum of coefficients for sample patient risk factors)				**0.4610**		**1.4962**

* Patient characteristic falls into the excluded category. See Technical Specifications for additional information.

Note: Predicted episode measure values provide an indication of expected outcomes of care, based on national experience for home health patients with similar risk profiles.

[3] From Start of Care (SOC) OASIS Assessment

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Example #1:
HCC Sample Patient Risk Profile[4]

Example notes:
- 11 scenarios are shown. Scenarios differ by HCC, which is determined from SOC OASIS assessment (M1021/M1023).
- Predicted episode measure values in this example are calculated by adding HCC coefficients to sample patient predicated measure values.
- Among these scenarios, Predicted TNC Mobility ranges from 0.0252 (Scenario 1) to 0.4844 (Scenarios 10 and 11); Predicted TNC Self-Care ranges from 0.3175 (Scenario 1) to 1.5180 (Scenarios 10 and 11).
- Quality episodes can be characterized by multiple HCCs (Scenarios 9 and 11); each HCC contributes to predicted episode measure value.
- HCCs have may have zero (0) coefficients and therefore not impact predicted measure values (compare Scenarios 10 and 11).

Hierarchical Condition Category (HCC)	Predicted Episode Measure Value	
	TNC Mobility	TNC Self-Care
Scenario 1: HCC73 Amyotrophic Lateral Sclerosis (ALS) and Other Motor Neuron Disease	0.0252	0.3175
Scenario 2: HCC77 Multiple Sclerosis	0.2770	1.2099
Scenario 3: HCC8 Metastatic Cancer and Acute Leukemia	0.3464	1.1575
Scenario 4: HCC52 Dementia Without Complication	0.4109	1.2585
Scenario 5: HCC85 Congestive Heart Failure	0.4202	1.3939
Scenario 6: HCC18 Diabetes with Chronic Complications	0.4286	1.4213
Scenario 7: HCC111 Chronic Obstructive Pulmonary Disease	0.4317	1.4225
Scenario 8: HCC19 Diabetes without Complication	0.4522	1.4665
Scenario 9: HCC86 Acute Myocardial Infarction and HCC19 Diabetes without Complication	0.4753	1.4883
Scenario 10: HCC86 Acute Myocardial Infarction	0.4844	1.5180
Scenario 11: HCC86 Acute Myocardial Infarction and HCC17 Diabetes with Acute Complications	0.4844	1.5180

[4] For all scenarios, End of Care (EOC) = Discharged to Community, not to hospice.

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Example #2: SOC Functional Limitations
HCC18: Diabetes with Chronic Complications[4]

Example Notes:
- Two (2) scenarios are shown.
- Scenario 1 shows predicted TNC Change measure values for the **Sample Patient Risk Profile** with HCC18 Diabetes with Chronic Complications.
- Scenario 2 modifies the Scenario 1 patient risk profile to show the effects of greater functional limitations at SOC. This scenario used covariates one (1) category higher for dyspnea, mobility, self-care, and oral medications management risk factors.
- This example shows that predicted episode measure values may be higher for patients with greater SOC functional limitations.

Hierarchical Condition Category (HCC)	Predicted Episode Measure Value	
	TNC Mobility	**TNC Self-Care**
Scenario 1: HCC18 Diabetes with Chronic Complications; Sample Patient Risk Profile SOC functional limitations (dyspnea, mobility, self-care, oral medications management)	0.4286	1.4213
Scenario 2: HCC18 Diabetes with Chronic Complications; Sample Patient Risk Profile, greater functional limitations (at SOC, one category higher for dyspnea, mobility, self-care, oral medications management)	0.7049	2.3164

[4] For all scenarios, EOC = Discharged to Community, not to hospice.

Technical Specifications for the TNC Change Measures

The technical specifications provide detail on risk factors and prediction model coefficients (excerpt below). See the *Technical Specifications for the Total Normalized Composite Change Measures*, April 2023 and October 2021, available on the [Expanded HHVBP Model webpage](#) under "Quality Measures."

III. Risk Factors, Covariates, and Estimated Coefficients

Recalibrated models, effective CY 2023

Risk Factor #	Risk Factor	Variable Name	Excluded Category Indicator	TNC Change in Mobility		TNC Change in Self Care	
				Covariate	Coefficient	Covariate	Coefficient
1	Age	AGE_0_54		1	-0.0059	1	-0.0474
		AGE_55_59		2	-0.0123	2	-0.0389
		AGE_60_64		3	-0.0187	3	-0.0478
		AGE_65_69	Excluded category				
		AGE_70_74		4	-0.0028	4	0.0014
		AGE_75_79		5	-0.0160	5	-0.0265
		AGE_80_84		6	-0.0362	6	-0.0732
		AGE_85_89		7	-0.0662	7	-0.1422
		AGE_90_94		8	-0.1065	8	-0.2561
		AGE_95PLUS		9	-0.1594	9	-0.4236
2	Gender	GENDER_FEMALE	Excluded category				
		GENDER_MALE		10	0.0189	10	0.0111
3	Payment source	PAY_MCARE_FFS	Excluded category				
		PAY_MCARE_HMO		11	-0.0116	11	-0.0115
		PAY_MCAREANDMCAID		12	-0.0705	12	-0.1777
		PAY_MCAID_ONLY		13	-0.0164	13	-0.0454
		PAY_OTHER_COMBO		14	0.0080	14	0.0502
4	SOC/ROC and Admission Source	SOC_INPT	Excluded category				
		SOC_COMM		15	-0.0848	15	-0.2057
		ROC		16	-0.0893	16	-0.2244

The magnitude and sign of the coefficient represents the difference in the episode-level predicted value between episodes with a covariate present (= 1) and episodes with a covariate not present (= 0), holding other covariates constant.