Expanded Home Health Value-Based Purchasing (HHVBP) Model
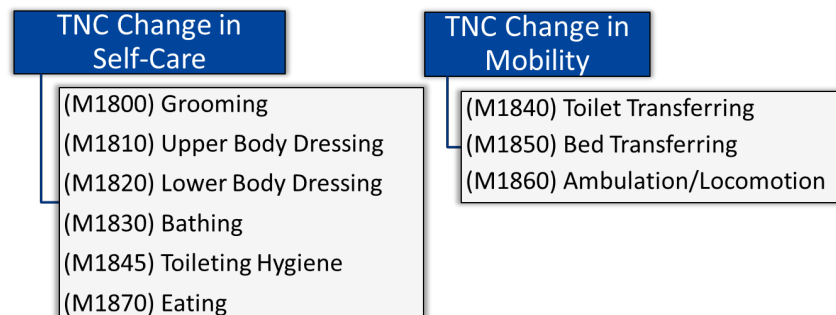
Calculating the Total Normalized Composite (TNC) Change Measures

May 2022

Introduction

The goals of home health care are to provide restorative care when improvement is expected, maintain function and health status if improvement is not expected, slow the rate of functional decline to avoid institutionalization in an acute or post-acute care setting, and/or facilitate transition to end-of-life care, when appropriate. The Centers for Medicare & Medicaid Services (CMS) expanded Home Health Value-Based Purchasing (HHVBP) Model includes two (2) Total Normalized Composite (TNC) measures – TNC Change in Self-Care (TNC Self-Care) and TNC Change in Mobility (TNC Mobility). The TNC measures represent a new direction in how quality of patient care is measured in home health as patients who receive care from a home health agency (HHA) may have functional limitations and may be at risk for further decline in function because of limited mobility and ambulation. These TNC measures capture the level of change in function in either direction, both positive (i.e., more independent) and negative (i.e., more dependent), for multiple Outcome and Assessment Information Set (OASIS) items, as shown in **Exhibit 1**. The calculations for TNC measures are based on eligible home health episodes of patients covered by Medicare fee-for-service (FFS), Medicare Advantage, Medicaid FFS, and Medicaid managed care.

Exhibit 1. OASIS items included in TNC Measures

TNC Change in Self-Care	TNC Change in Mobility
(M1800) Grooming (M1810) Upper Body Dressing (M1820) Lower Body Dressing (M1830) Bathing (M1845) Toileting Hygiene (M1870) Eating	(M1840) Toilet Transferring (M1850) Bed Transferring (M1860) Ambulation/Locomotion

The TNC measures capture change between Start of Care (SOC)/Resumption of Care (ROC) and End of Care (EOC). For the purposes of the TNC measures, the definition of EOC is M0100 = RFA 9, Discharge from Agency. TNC measures are risk-adjusted to "level the playing field" based on patients' underlying risk factors. There are also exclusions in place for nonresponsive patients (for detail, see Measure Exclusions). In general, a positive change between SOC/ROC and EOC assessment increases the measure values more than no change or a negative change. Further details about the inclusion of the TNC measures in the expanded HHVBP Model are available in the Calendar Year (CY) 2022 Home Health Prospective Payment System (HH PPS) final rule.

Risk adjustment

Risk adjustment is necessary to account for differences in patient case mix among HHAs that affect performance on outcome measures. For example, age, functional status, and pre-existing conditions impact a patient's likelihood of experiencing a TNC measure change during a quality episode. Risk adjustment accounts for the differing types of patients served by HHAs and enables comparison across HHAs. CMS employs similar risk adjustment methods for other quality measures and for other settings.

The general formula for risk adjustment of OASIS outcomes measures is as follows:

$$HHA_{Risk\text{-}Adjusted} = (HHA_{Observed} - HHA_{Predicted}) + National_{Predicted}$$

- **$HHA_{Risk\text{-}Adjusted}$**: HHA's risk-adjusted outcome measure value.

- **$HHA_{Observed}$**: HHA's average observed values for the outcome measure.

- **$HHA_{Predicted}$**: HHA's average predicted values for the outcome. Predicted values are obtained from a regression model using a set of risk factors, as cited in the CMS technical specifications report, Home Health Value-Based Purchasing Model Composite Outcome Measures.

- **$National_{Predicted}$**: average predicted value across all eligible episodes in the nation.
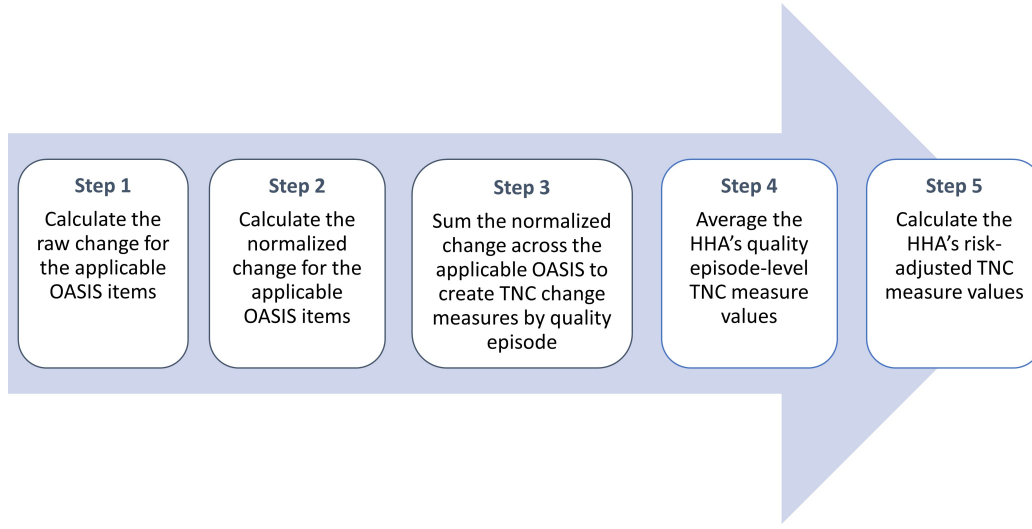
An HHA's risk-adjusted measure value is calculated by averaging the HHA's observed (i.e., not risk adjusted, calculated from reported OASIS data) measure values across all its patients and subtracting the HHA's average predicted measure value across all its patients. To standardize the result, the national measure value is then added to obtain the risk-adjusted outcome measure for the HHA.

The 5-step process for calculating the risk adjusted TNC Self-Care and TNC Mobility measures

CMS calculates the TNC Self-Care and TNC Mobility measures at the quality episode level and then aggregates to the HHA level using a 5-step process for each TNC Measure (**Exhibit 2**). Steps 1 and 2 describe the calculation of the normalized change values for each applicable OASIS item at the quality *episode level*. Step 3 sums normalized OASIS item change values to create observed (not risk-adjusted) quality *episode level* TNC measures. Steps 4 and 5 describe the aggregation of these values to the *agency level* and risk adjustment based on national data.

Exhibit 2. 5-step process for calculating the TNC Change measures

Step 1	Step 2	Step 3	Step 4	Step 5
Calculate the raw change for the applicable OASIS items	Calculate the normalized change for the applicable OASIS items	Sum the normalized change across the applicable OASIS to create TNC change measures by quality episode	Average the HHA's quality episode-level TNC measure values	Calculate the HHA's risk-adjusted TNC measure values

Step 1: Calculate the raw change for the applicable OASIS items by quality episode

In the first step, CMS calculates the raw change score for each applicable OASIS item, which is the difference between the patient's status at SOC or ROC and the patient's status at EOC. CMS does this for each of the six (6) applicable OASIS items used to calculate the TNC Self-Care measure and the three (3) applicable OASIS items used to calculate the TNC Mobility measure.

> **Step 1, Example**: A quality episode with a Bathing score of "3" at SOC and a score of "0" at EOC is calculated as follows: 3 – 0 = 3. The raw change value is "+3".

Please note that the calculations include patients who are fully independent at the start or resumption of care. Patients who are fully independent can either remain the same or decline, but they cannot improve based on OASIS assessment. If the patient's status remains unchanged from SOC/ROC to EOC, the quality episode will result in a change score of "0". If the patient's status declines, the quality episode will result in a negative change score.

Step 2: Calculate the normalized change for the applicable OASIS items by quality episode

> **Step 2, Example**: Following the Step 1 example, take the raw change score of "3" and divide it by "6" (maximum possible change for Bathing). Calculated as follows: 3 / 6 = 0.5. The normalized change value is "+0.5".

For each applicable OASIS item used to calculate the TNC measure score, CMS normalizes quality episode raw change by dividing the value by the maximum possible change for that OASIS item. CMS repeats this process for each applicable OASIS item for the two (2) TNC measures. This results in change values normalized to fit a range of -1 and +1 for each of the nine (9) OASIS items.

The maximum possible change for an individual activity (e.g., bathing, ambulation/locomotion) is determined by the number of responses for the applicable OASIS item. For example, Bathing (M1830) has seven response options with "0" being most independent and "6" being least independent. The greatest possible change that could occur from SOC/ROC to discharge is "+6" or "-6", which would occur with a change from "0" to "6" (i.e., -6) or from "6" to "0" (i.e., +6).

Step 3: Sum the normalized change across the applicable OASIS items to create TNC change measures by quality episode

The normalized change values are summed for each quality episode for the six (6) OASIS items used in TNC Self-Care measure and three (3) OASIS items used in TNC Mobility measure, respectively. The maximum possible range for the sum of the normalized change values at the quality episode level reflects the number of OASIS items included in the measure. The range is "-6" to "+6" for the TNC Self-Care measure (6 items) and "-3" to "+3" for the TNC Mobility measure (3 items).

Step 4: Average the HHA's quality episode-level TNC measure values

CMS averages the quality episode level TNC Self-Care and TNC Mobility change values for all of an HHA's quality episodes that end in discharge during the performance period.

Step 5: Calculate the HHA's risk-adjusted values

The agency's TNC Self-Care and TNC Mobility observed scores are risk-adjusted based on the following formula:

$$\text{HHA}_{\text{Risk-Adjusted}} = (\text{HHA}_{\text{Observed}} - \text{HHA}_{\text{Predicted}}) + \text{National}_{\text{Predicted}}$$

This is the same formula used to risk-adjust the other OASIS-based measures included in the HHVBP Model. Note that the agency's predicted value ($\text{HHA}_{\text{Predicted}}$) is the average of the episode-level predicted values, based on individual patient risk profiles across all eligible quality episodes for that agency, and the national predicted value ($\text{National}_{\text{Predicted}}$) is based on the patient risk profiles across all eligible quality episodes for all agencies in the US.

CaseScenarios

Patient-level examples

The following patient examples illustrate Steps 1-3 of the 5-step process for calculating the TNC measures. These three (3) steps focus on calculations at the quality episode level for individual patients while steps 4 and 5 focus on calculations at the HHA level. See the HHA-level example for scenarios illustrating steps 4 and 5.

Scenario 1: Positive Change - Ms. L

Ms. L is 80 years old and referred to home health by her primary care physician. **Exhibit 3** summarizes her status at SOC and EOC scores for each of the six (6) OASIS items included in TNC Self-Care measure and the three (3) OASIS items included in TNC Mobility measure.

Exhibit 3. Status summary for Ms. L

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Self-Care	Grooming (M1800)	3	1	3	2	0.667	3.70
	Upper Body Dressing (M1810)	2	0	3	2	0.667	
	Lower Body Dressing (M1820)	3	0	3	3	1.00	
	Bathing (M1830)	5	2	6	3	0.50	
	Toileting Hygiene (M1845)	2	0	3	2	0.667	
	Eating (M1870)	1	0	5	1	0.20	
TNC Change in Mobility	**Toilet Transferring (M1840)**	**2**	**0**	**4**	**2**	**0.50**	**1.40**
	Bed Transferring (M1850)	**2**	**0**	**5**	**2**	**0.40**	
	Ambulation (M1860)	**5**	**2**	**6**	**3**	**0.50**	

Ms. L became independent in Toilet Transferring (M1840) and Bed Transferring (M1850) and went from being chairfast to requiring use of a walker for ambulation. Focusing on the OASIS items included in the *TNC Mobility measure*, Ms. L's functional status from SOC to EOC changes from a "2" to a "0" on both Toilet Transferring and Bed Transferring. For Ambulation (M1860), the change is from "5" at SOC to a "2" at EOC.

Step 1. **Calculate the raw change score for each applicable OASIS item**

Subtract the status at EOC score from the status at SOC score for each individual OASIS item. **Exhibit 4** illustrates the raw change for each applicable OASIS item for TNC Mobility.

Exhibit 4. Raw change for each OASIS item included in TNC Mobility measure

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Mobility	Toilet Transferring (M1840)	2	0	4	**2**	0.50	1.40
	Bed Transferring (M1850)	2	0	5	**2**	0.40	
	Ambulation (M1860)	5	2	6	**3**	0.50	

Step 2. **Calculate the normalized change for each applicable OASIS item**

Normalizing creates a common scale for combining applicable OASIS items. The calculation takes into consideration the maximum possible change for each OASIS item. Ms. L has the same raw change score on two (2) OASIS items, Toilet Transferring (M1840) and Bed Transferring (M1850), as shown in **Exhibit 4**. Based only on the results of the raw change calculation, Ms. L's status change from SOC/ROC to EOC looks identical since the raw change is "2" for both items. However, the calculation of the normalized change, as shown in **Exhibit 5**, includes use of the maximum possible change for each OASIS item. In this case, Toilet Transferring allows for a possible maximum change of "4" if a patient starts at "4" and ends at "0" by EOC. For Bed Transferring, the maximum possible change is "5".

To create the normalized change for each OASIS item, the raw change is divided by the maximum possible change for that OASIS item. For Ms. L, the raw change of "2" for Toilet Transferring divided by a maximum possible change of "4" results in the normalized change of 0.5. For Bed Transferring, the normalized change equals 0.4—the raw change of "2" divided by the maximum possible change of "5". Changing from "2" to "0" on Toilet Transferring represents a greater relative change given this item has a maximum score of "4" when compared to Bed Transferring, which has a maximum score of "5". Therefore, Ms. L's normalized change from SOC to EOC is greater for the Toilet Transferring activity than for the Bed Transferring activity. For Ambulation (M1860), the normalized change is 0.5—the raw change of "3" divided by the maximum possible change of "6". **Exhibit 5** shows the normalized change for each of the OASIS items for TNC Mobility.

Exhibit 5. Normalized change for OASIS items included in the TNC Mobility measure

					Step 1	Step 2	Step 3
Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Raw Change	Normalized Change	Sum of Normalized Change
TNC Change in Mobility	Toilet Transferring (M1840)	2	0	4	2	**0.50**	1.40
	Bed Transferring (M1850)	2	0	5	2	**0.40**	
	Ambulation (M1860)	5	2	6	3	**0.50**	

Step 3. Sum the normalized change across the applicable OASIS items to create TNC measures by quality episode

Add the normalized change values across the OASIS items that constitute TNC Mobility. Given Ms. L showed positive change across all three (3) OASIS items, the sum of the normalized change for TNC Mobility, 1.4, is positive (**Exhibit 6**).

Exhibit 6. Sum normalized change across OASIS items included in the TNC Mobility measure

					Step 1	Step 2	Step 3
Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Raw Change	Normalized Change	Sum of Normalized Change
TNC Change in Mobility	Toilet Transferring (M1840)	2	0	4	2	0.50	**1.40**
	Bed Transferring (M1850)	2	0	5	2	0.40	
	Ambulation (M1860)	5	2	6	3	0.50	

Scenario 2: No Change/Decline – Mr. A

The previous example reviewed the first three (3) steps of the "5-step process" to calculate the TNC Mobility measures for a patient who showed positive change in all three (3) OASIS items included in the TNC Mobility measure. The following example will further illustrate these three (3) steps for another patient, Mr. A, who went from just needing his clothing set out for him to being entirely dependent for upper body dressing. In addition, he went from being independent in bathing to needing another person present throughout the bath for assistance. Mr. A's self-care abilities stayed the same or declined between SOC and EOC, as shown in **Exhibit 7**.

Exhibit 7. Status summary for Mr. A

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Self-Care	Grooming (M1800)	1	1	3	0	0.000	-2.50
	Upper Body Dressing (M1810)	1	3	3	-2	-0.667	
	Lower Body Dressing (M1820)	1	2	3	-1	-0.333	
	Bathing (M1830)	0	3	6	-3	-0.500	
	Toileting Hygiene (M1845)	0	3	3	-3	-1.000	
	Eating (M1870)	0	0	5	0	0.000	
TNC Change in Mobility	Toilet Transferring (M1840)	1	4	4	-3	-0.750	-1.65
	Bed Transferring (M1850)	1	3	5	-2	-0.400	
	Ambulation (M1860)	1	4	6	-3	-0.500	

Mr. A's status at both SOC and EOC across the nine (9) OASIS items reveals that he declined in four (4) out of six (6) self-care activities (M1810, M1820, M1830, and M1845) and all three (3) mobility activities (M1840, M1850, M1860). Between SOC and EOC, his status remained unchanged at "1" for Grooming (M1800) and at "0" for Eating (M1870). For each of the two (2) TNC measure calculations, the following steps are applied:

Step 1. **Calculate the raw change score for each applicable OASIS item**

Subtract the EOC score from the SOC score for each individual OASIS item (**Exhibit 8**). For example, there is a raw change of -2 for Upper Body Dressing (M1810)— "1" minus "3".

Exhibit 8. Raw change for the OASIS items included in each TNC measure

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Self-Care	Grooming (M1800)	1	1	3	0	0.000	-2.50
	Upper Body Dressing (M1810)	1	3	3	-2	-0.667	
	Lower Body Dressing (M1820)	1	2	3	-1	-0.333	
	Bathing (M1830)	0	3	6	-3	-0.500	
	Toileting Hygiene (M1845)	0	3	3	-3	-1.000	
	Eating (M1870)	0	0	5	0	0.000	
TNC Change in Mobility	Toilet Transferring (M1840)	1	4	4	-3	-0.750	-1.65
	Bed Transferring (M1850)	1	3	5	-2	-0.400	
	Ambulation (M1860)	1	4	6	-3	-0.500	

Step 2. Calculate the normalized change for each applicable OASIS item

To compute the normalized change for each OASIS item, divide the raw change by the maximum possible change for each OASIS item. The normalized change for each OASIS item is highlighted in **Exhibit 9**.

Exhibit 9. Normalized change for the OASIS items included in each TNC measure

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Self-Care	Grooming (M1800)	1	1	3	0	**0.000**	-2.50
	Upper Body Dressing (M1810)	1	3	3	-2	**-0.667**	
	Lower Body Dressing (M1820)	1	2	3	-1	**-0.333**	
	Bathing (M1830)	0	3	6	-3	**-0.500**	
	Toileting Hygiene (M1845)	0	3	3	-3	**-1.000**	
	Eating (M1870)	0	0	5	0	**0.000**	
TNC Change in Mobility	Toilet Transferring (M1840)	1	4	4	-3	**-0.750**	-1.65
	Bed Transferring (M1850)	1	3	5	-2	**-0.400**	
	Ambulation (M1860)	1	4	6	-3	**-0.500**	

Step 3. Sum the normalized change across the applicable OASIS items to create TNC change measures by quality episode

Add the normalized change values for each individual OASIS item that constitutes TNC Self-Care and TNC Mobility, respectively. Because Mr. A declined in all mobility activities and four (4) of the six (6) self-care activities, the two (2) values calculated in Step 3 are both negative: -2.50 for TNC Self-Care and -1.65 for TNC Change in Mobility (**Exhibit 10**).

Exhibit 10. Sum of normalized change for the OASIS items included in each TNC measure

Composite Measure	OASIS Item	Status at SOC	Status at EOC	Maximum Possible Change	Step 1 Raw Change	Step 2 Normalized Change	Step 3 Sum of Normalized Change
TNC Change in Self-Care	Grooming (M1800)	1	1	3	0	0.000	**-2.50**
	Upper Body Dressing (M1810)	1	3	3	-2	-0.667	
	Lower Body Dressing (M1820)	1	2	3	-1	-0.333	
	Bathing (M1830)	0	3	6	-3	-0.500	
	Toileting Hygiene (M1845)	0	3	3	-3	-1.000	
	Eating (M1870)	0	0	5	0	0.000	
TNC Change in Mobility	Toilet Transferring (M1840)	1	4	4	-3	-0.750	**-1.65**
	Bed Transferring (M1850)	1	3	5	-2	-0.400	
	Ambulation (M1860)	1	4	6	-3	-0.500	

HHA-level example

The following HHA-level example shows the final two (2) steps of the "5-step process" of calculating the risk-adjusted TNC measures.

The risk-adjustment formula is:

$$\text{HHA}_{\text{Risk-Adjusted}} = (\text{HHA}_{\text{Observed}} - \text{HHA}_{\text{Predicted}}) + \text{National}_{\text{Predicted}}$$

Exhibit 11 contains simulated TNC Mobility measure data for twenty (20) quality episodes in a fictional HHA; twenty (20) is the minimum number of quality episodes in a given performance period required for the calculation of the TNC measures. For simplicity, this example does not show TNC Self-Care data, which would use the same calculation steps. In Column B, the agency has recorded the observed TNC Mobility scores (results of Steps 1-3, above) for each of those twenty (20) episodes. These data can now be used to calculate the agency's risk-adjusted TNC Mobility score ($HHA_{Risk-Adjusted}$) by using Steps 4 and 5.

Step 4. Average the HHA's quality episode-level TNC measure values

In this step, calculate the average of the quality episode-level sums of the normalized TNC Mobility change scores for all the HHA's quality episodes that end in discharge during the performance period. In **Exhibit 11**, this is the average of the 20 values shown in Column B. The result appears in Column C ($HHA_{Observed}$); this is the sum of the values in Column B (10.82) divided by the number of episodes (20); or 10.82 ÷ 20 = 0.54. HHA level predicted value (Column E) is calculated as the average of the episode-level predicted values for the HHA (shown in Column D). Methods used for calculating episode-level predicted scores are described in the Risk Adjustment Technical Steps and Risk Factor Specifications resource.

Step 5. Calculate the HHA's risk adjusted TNC measure values

Step 5 uses the results from Step 4, $HHA_{Observed}$ (Column C), the average of the episode-level predicted TNC Mobility scores, $HHA_{Predicted}$ (Column E), and the predicted national TNC Mobility score, $National_{Predicted}$ (Column F). In this example the $HHA_{Predicted}$ score is 0.36 (Column E), the average of the episode-level predicted values for the HHA shown in Column D. The $National_{Predicted}$ score of 1.00 (Column F) is for illustrative purposes only.

> When comparing this agency's $HHA_{Observed}$ to $HHA_{Predicted}$ for TNC Mobility, the observed score of 0.54 (Column C) in **Exhibit 11** is higher than the predicted score of 0.36 (Column E), which indicates that this agency's performance was better than expected for the TNC Mobility measure.

After applying the risk adjustment formula, this agency has an adjusted TNC Mobility ($HHA_{Risk-Adjusted}$; Column G) value of 1.18:

$$\underline{1.18}\ (HHA_{Risk-Adjusted}) = (\underline{0.54}[HHA_{Observed}] - \underline{0.36}[HHA_{Predicted}]) + \underline{1.00}(National_{Predicted})$$

Exhibit 11: Input to create risk-adjusted TNC Mobility measure

A	B	C	D	E	F	G
Quality Episode	**From Steps 1 to 3: TNC Mobility Score by Episode**	**Step 4: Observed HHA TNC Mobility (HHA$_{Observed}$)**	**Episode Predicted TNC Mobility Score**	**Predicted HHA TNC Mobility (HHA$_{Predicted}$)**	**Predicted National TNC Mobility (National$_{Predicted}$)**	**Step 5: Risk-Adjusted HHA TNC Mobility (HHA$_{Risk-Adjusted}$)**
1	1.82		0.01			
2	0.87		0.92			
3	0.50		-0.08			
4	0.65		0.06			
5	-0.75		-0.66			
6	0.78		0.52			
7	-1.43		0.82			
8	2.35		0.76			
9	-1.35		0.12			
10	0.83	**0.54**	0.83	**0.36**	**1.00**	**1.18**
11	0.98		1.46			
12	-0.92		0.08			
13	0.42		-0.06			
14	1.77		0.69			
15	1.02		0.34			
16	2.30		0.15			
17	1.03		0.95			
18	-0.62		-0.51			
19	0.37		-0.18			
20	0.20		0.90			

Measure Exclusions

Home health quality episodes for which the patient was non-responsive at SOC/ROC are excluded from the TNC measures. The following OASIS items measure non-responsive:

> When an HHA has fewer than 20 eligible quality episodes in a given performance period the measure is not calculated.

- M1700 – Cognitive Functioning = 04 Totally dependent due to disturbances such as constant disorientation, coma, persistent vegetative state, or delirium, and/or

- M1710 – When Confused = NA Patient nonresponsive, and/or

- M1720 – When Anxious = NA Patient nonresponsive.

In addition, the TNC measures have the same generic exclusions as the Home Health Quality Reporting Program (HH QRP) OASIS-based measures and exclude patients who:

- Do not have a home care payment source of Medicare (traditional fee-for-service, Medicare (HMO/managed care/Advantage plan) or Medicaid (traditional fee-for-service, HMO/managed care), and/or

- Are less than 18 years, and/or

- Are receiving pre- and/or post-partum maternity services, and/or

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- Are receiving personal care only.

For the TNC change measures, the calculation only includes episodes that end in Discharge from Agency (M0100, Assessment is Currently Being Completed for the Following Reasons = 9) because the OASIS items used in these measures are not collected when EOC is for other reasons (i.e., transfers and death).

As the TNC measures are unique to the HHVBP Model and not used in the HH QRP, please direct questions regarding the expanded HHVBP Model TNC measures to HHVBPquestions@lewin.com.