Validation of the 15-Care Transition Measure in Indian Settings

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Abstract

Background: The Care Transition Measure (CTM-15), a 15-item tool, assesses care quality from the patient's viewpoint during transitions. This study aimed to assess the psychometric properties of both the CTM-15 and its 3-item version (CTM-3) in an Indian tertiary care hospital.

Methods: 300 patients from the hospital were interviewed three weeks post-discharge, using either English or Marathi versions of the CTM-15. Psychometric properties were evaluated separately for each language. Internal consistency reliability was assessed with Cronbach's alpha, and construct validity was tested via T-tests or Pearson's correlation. Exploratory factor analysis examined CTM-15's latent dimensions.

Results: 112 (English) and 167 (Marathi) subjects completed the interviews. Cronbach's alpha values for CTM-15 ranged from 0.82 to 0.87, and for CTM-3 from 0.58 to 0.61. Both versions correlated with post-discharge care experience (Pearson's correlation: 0.36 to 0.46). English versions effectively discriminated between patients with and without ED visits or rehospitalization. Marathi versions showed no such difference. Both versions exhibited a 4-factor structure.

Conclusions: The CTM is a valid and reliable measure for care transition quality in India. Implementing a simpler three-point response scale is feasible. Further studies should explore the Marathi version's discriminatory power.

Keywords: Care Transition, Post Discharge Management, Tool Validation

1. Introduction

The transition of patients between healthcare facilities, known as care transition, is a critical aspect of healthcare systems globally, impacting patient outcomes and resource utilization [1–5]. Recognizing the significance of patient experience in assessing healthcare quality, various organizations like the Joint Commission and the National Council on Quality have focused on improving care transitions [6–12]. Patient-centric approaches have been recommended by bodies like the Institute of Medicine to enhance rehabilitation processes [13-15]. However, despite the emphasis on patient experience, there's a dearth of validated measures globally.

The 15-item Care Transition Measure (CTM-15) stands out as an effective tool for evaluating care transitions from the patient's perspective [16-19]. Originally designed to gauge overall care transitions, it has been instrumental in assessing healthcare performance [17,20]. The recent development of a shortened version, CTM-3, endorsed by the National Quality Forum, promises cost-effectiveness and ease of use [16,21,22]. However, such measures have primarily been accessible in Western countries and a few Asian nations [23-27].

In this context, our study aimed to assess the psychometric properties of CTM-15 and CTM-3 in the unique context of a tertiary hospital in India. Given the World Health Organization's average rating of healthcare quality in India, there's a pressing need for validated transition of care measures to ensure quality care during transitions. Our evaluation encompassed both English and Marathi versions of the tool, catering to the linguistic diversity of the Indian population. Using a three-point Likert response scale, we aimed to optimize the utility of the instrument, considering that fewer response options can enhance respondent control and cognitive load. Through this study, we seek to contribute to the advancement of transition of care measures and ultimately improve patient care in India.

2. Methodology

2.1. Study Setting and Sampling

Patients discharged from the study hospital between January and June 2015 were selected as the subjects of this study. Inclusion criteria were patients over the age of 50 and hospitalized in the discipline of internal medicine and general surgery. Ethics committee approval for the study was received from the Ethics Committee.

2.2. Data collection

Before discharge, patients were informed about the study and their consent was obtained. Patients received this CTM survey during their return hospital visit 3 weeks after discharge. Patients were given English or Marathi texts according to their preference. The survey also sought information on patient demographics, length of stay prior to discharge, emergency department visits, non-hospitalization status, and observational follow-up after discharge.

2.3. Instrument

The CTM-15 is a 15-item measure of perceived change in care. This measure is based on a principled test that includes items regarding the patient's critical perception, importance of interests, planning management, and writing and understanding of treatment planning [20]. All questions used a three-point Likert response, including "disagree," "none," and "agree." According to CTM-15, a total score between 0 and 100 can be calculated; higher scores indicate better care transitions. The English version and Marathi translation were used in this study. The Marathi version was developed from a later translation of the English CTM by one of the Marathi researchers of this study. CTM-3 includes three aspects of CTM-15: (i) patient understanding of medication therapy; (ii) situations where patient preferences are taken into account in determining the patient's need for health care after discharge; (iii) control of the patient's sense of responsibility [28] Therefore, the CTM-3 score can be calculated as the control of CTM-15 [29-31].

2.4. Statistical Analysis

The study sample was characterized through descriptive analysis, which involved determining the frequency of categorical variables and the mean (standard deviation) of continuous variables. Internal reliability of the Care Transition Measure (CTM) was assessed using Cronbach's alpha, with values ≥ 0.7 considered satisfactory. To evaluate construct validity, hypotheses pertaining to emergency department (ED) visits and readmissions post-discharge were tested. Additionally, convergent validity was examined by assessing the correlation between CTM-15 and CTM-3 scores using the Pearson correlation coefficient. Separate analyses were conducted for the English and Marathi versions of CTM-15 and CTM-3, utilizing three-point Likert responses for ease of administration. Exploratory factor analysis was employed to uncover underlying structures of CTM-15 item scales, retaining factors with eigenvalues > 1.0 and labeling items with factor loadings > 0.5. All statistical analyses were performed using SPSS for Windows (version 20) with a significance level set at 0.05 for all two-tailed tests.

3. Results

3.1. Demographic characteristics

A total of 300 patients or their caregivers were interviewed. The overall participation rate was 93% After excluding 21 respondents who were interviewed in Hindi, 279 patients or their caregivers who were interviewed in English (n = 112) & Marathi (n = 167), with no missing data on the CTM-15 questions were included in data analysis. Table 1 summarises the basic demographic information of the participants of the study. It can be seen that the vast majority of respondents was proxies. English-speaking and Marathi-speaking respondents had similar characteristics.

Table 1: Characteristics of Respondents

Variable		Total n = 279	English n = 112	Marathi n = 167	P–value
Gender n(%)	Male Female	201 78	102 10	99 68	0.593
Age (years)	Mean (SD) Range	77.16 (8.93) 50–99	77.23 (8.68) 50–99	76.98 (9.52) 50–99	0.761
Length of Stay (days)	Mean (SD) Range	10.75 (9.07) 1–75	11.03 (9.56) 1–75	10.04 (7.67) 1–75	0.245
ED visits, n(%)	Yes No	23 256	15 140	08 116	0.349
Re-hospitalisation n(%)	Yes No	60 219	29 135	31 84	0.220

Distribution of CTM item scores are displayed in Table 2. CTM-3 scores were lower than CTM-15 scores, and English version scored higher than Marathi version.

Table 2: Means and Standard Deviations of CTM Item and Total Scores

S.N.	CTM – Item	English		Marathi	
		Mean	SD	Mean	SD
1.	Agreed health goals & means	66.2	47.0	57.3	29.3
2.	Preference doing health needs *	79.0	38.5	61.7	26.7
3.	Preference deciding where needs met	82.6	35.8	64.7	25.2
4.	Had information needed for self-care	75.7	42.4	66.1	27.2
5.	Understanding how to manage health	84.7	35.1	68.8	24.9
6.	Understand signs & symptoms	51.6	48.7	49.5	29.3
7.	Understand medications purpose	91.8	24.5	76.1	19.6
8.	Understand how to take medications	94.2	19.7	78.0	17.2
9.	Understand medications side effects*	38.6	44.9	47.4	28.6
10.	Had written list of appointments & tests	88.3	28.5	73.6	17.5
11.	Had written care plan	24.9	41.7	38.8	25.8
12.	Understand what makes better or worse	76.2	42.0	59.1	27.5
13.	Understand care responsibilities *	83.7	36.4	67.4	23.8
14.	Confident knew how to manage	88.4	29.9	70.6	19.5
15.	Confident could do what needed	85.9	32.4	68.0	22.4
	CTM–15 Total Score	74.1	19.8	63.1	15.4
	CTM–13 Total Score	67.1	25.6	58.8	18.1

Item scores are coded as 0 = Disagree, 50 = Neutral, 100 = Agree for the 3-point scale.

* CTM-3 items.

3.2. CTM-15

The Cronbach's alpha values of the CTM-15 score for three-point response scale was 0.87 and 0.82 for English & Marathi versions. Among English-speaking respondents, patients who did not report ED visits for the index condition had higher mean CTM-15 scores i.e., 66.81, than those who reported ED visits i.e., 62.1 ($p < 0.05$, two sample test) and similarly, patients who reported no rehospitalisation for the index condition had higher CTM-15 scores i.e., 66.7 than those who reported rehospitalisation i.e., 62.8 ($p < 0.05$, two sample test) (Table 3A). However, such differences in CTM-15 scores were not observed in the Marathi-speaking subgroup, as the P-value is higher than 0.05 (Table 3A).

There was moderate correlation between the CTM-15 and the experience scale, regardless of survey language and response scale (correlation coefficient: 0.39 to 0.46, $p > 0.001$ for both versions, Table 3A).

Table 3A: Association of CTM-15 Score with ED Visits, Rehospitalisation, and Experience with Care

S. N.			English			Marathi		
			Mean	SD	P-value	Mean	SD	P-value
1.	ED visit for similar condition	Yes	62.1	19.7	0.020	60.9	19.1	0.492
		No	66.8	13.5		63.4	14.9	
2.	Rehospitalisation for similar condition	Yes	62.8	19.2	0.041	62.8	18.2	0.908
		No	66.7	13.5		63.2	15.0	
3.	Correlation with EXP score, Pearson's (r)		0.397		< 0.001	0.461		< 0.001

3.3. CTM-3

The Cronbach's alpha value of the CTM-3 based on the three-point response scale was 0.58 for the English version, and 0.61 for Marathi version. Similar to the results for CTM-15, the CTM-3 scores discriminated well between patients with and without ED visits or rehospitalisation ($p<0.05$) among English-speaking respondents; however, the CTM-3 scores were not different between patients reporting and not reporting ED visits or rehospitalisation ($p>0.05$) in the Marathi-speaking group (Table 3).

The correlation between the CTM-3 and experience scale was moderate for both language groups and response scales (correlation coefficient: 0.36 to 0.40, $p < 0.001$ for all, Table 3).

Table 3B: Association of CTM-3 Score with ED Visits, Rehospitalisation, and Experience with Care

S. N.			English			Marathi		
			Mean	SD	P-value	Mean	SD	P-value
1.	ED visit for similar condition	Yes	56.1	23.0	0.004	56.3	21.9	0.498
		No	63.0	16.4		59.2	17.6	
2.	Rehospitalisation for similar condition	Yes	56.9	22.8	0.009	58.7	21.8	0.977
		No	62.9	16.3		58.9	17.6	
3.	Correlation with EXP score, Pearson's (r)		0.399	-	< 0.001	0.378	-	< 0.001

The English and Marathi versions of the CTM-15 items measured on the three-point scale demonstrated a similar 4-factor structure. Based on item loadings, the four factors were general care plan, medication, agreement on care plan, and specific care instructions (Table 4).

Table 4: Factor Loadings of the CTM-15 Items Measured on the 3-point Scale after Varimax Rotation

S. N.	Item	English				Marathi			
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 4
1.	Agreed health goals & means	0.537	0.540	-	-	-	0.654	-	-
2.	Preference doing health needs *	-	0.847	-	-	-	0.885	-	-
3.	Preference deciding where needs met	-	0.853	-	-	-	0.884	-	-
4.	Had information needed for self-care	0.744	-	-	-	0.546	-	-	-
5.	Understanding how to manage health	0.745	-	-	-	0.654	-	-	-
6.	Understand signs & symptoms	-	-	-	0.665	-	-	-	0.655
7.	Understand medication's purpose	-	-	0.823	-	-	-	0.766	-
8.	Understand how to take medications	-	-	0.884	-	-	-	0.735	-
9.	Understand medications side effects *	-	-	-	0.627	-	-	-	0.566
10.	Had written list appointments & tests	-	-	0.572	-	-	-	0.671	-
11.	Had written care plan	-	-	-	0.782	-	-	-	0.733
12.	Understand what makes better or worse	0.683	-	-	0.330	-	-	-	0.540
13.	Understand care responsibilities*	0.808	-	-	-	0.647	-	-	-
14.	Confident knew how to manage	0.839	-	-	-	0.856	-	-	-
15.	Confident could do what needed	0.803	-	-		0.869`	-	-	-
Variance Explained		**67.3%**				**67.7%**			

4. Discussion

The analysis of our study revealed generally satisfactory psychometric performance of the Care Transition Measure (CTM), despite variations in indicator models. Specifically, we found that the long form of the CTM exhibited greater reliability compared to the short form, and the English version demonstrated higher validity than the Marathi version. Notably, the English version of the CTM-15 emerged as the most valid and reliable measure of care transition, exhibiting sufficient concordance to

distinguish between patients who presented to the emergency department (ED) or were readmitted, and those who did not, while remaining consistent with post-discharge care reports. These findings are consistent with prior research [16, 17, 23, 32, 33].

Moreover, three of the four core CTM items in our study were similar to those observed in American and Israeli populations [16,23]. However, our study stands as the first to examine the utility of the CTM in assessing patient perception in Hindi. While the Marathi versions of CTM-15 and CTM-3 demonstrated psychometric similarities to their English counterparts, they exhibited poor discrimination. Several potential explanations exist for this phenomenon.

Firstly, the observed poor discrimination may stem from sampling error, as evidenced by the relatively small number of patients in the Marathi subgroup reporting ED visits or readmissions. This limitation underscores the need for future studies to re-evaluate the Marathi CTM in larger patient samples. Secondly, respondents may have encountered difficulties understanding the CTM survey, particularly due to its lengthy wording, leading to potential misunderstandings and subsequent discrimination issues. Additionally, discrepancies in language quality between the Marathi and English versions may have contributed to misunderstanding and poor discrimination.

However, it is noteworthy that analysis of CTM items in both English and Marathi revealed similar latent patterns, suggesting no significant differences in response patterns between the two language groups. Future research should employ qualitative methods such as in-depth interviews or focus groups to explore respondent comprehension and responses to the CTM, with the aim of enhancing its performance for Marathi speakers.

Interestingly, our study found that the CTM score based on a three-point response scale outperformed the score based on a five-point response scale, indicating greater reliability and ease of response. This finding aligns with previous research indicating the superiority of the three-point scale in certain ethnic groups [30,34], highlighting the CTM's adaptability and ease of use.

While the CTM-3 exhibited lower internal consistency compared to the CTM-15, it correlated well with CTM-15 scores and demonstrated good construct validity among native English speakers. Therefore, the CTM-3 may serve as a viable alternative to the CTM-15, particularly in studies where burden considerations or large sample sizes may compromise reliability.

5. Limitations of the Study

Our study is subject to several limitations that may affect the generalizability of our findings. Firstly, our sample comprised patients aged 50 and older, which may restrict the applicability of our results to younger populations. Additionally, our inclusion criteria required patients to have undergone a full transition of care, potentially excluding individuals who did not experience such transitions.

Furthermore, the administration of the Care Transition Measure (CTM) during emergency room visits and readmissions introduces the possibility of bias into our study. Negative events such as these may influence respondents' perceptions of care, leading to recall bias and potentially skewing their responses towards negative experiences encountered during transitions of care. To mitigate this bias, future studies

may consider administering the CTM immediately after discharge and collecting data on emergency room visits and readmissions separately.

Moreover, while we aimed to capture patients' perspectives accurately, it is important to acknowledge that reports from elderly patients may not always be reliable. Research has shown that delirium, including periods of altered mental status, is common among older adults recently discharged from intensive care units, which may affect the accuracy of their responses. This highlights the need for cautious interpretation of findings and the importance of considering the potential impact of cognitive impairment on data validity.

6. Conclusion

Discharge is a matter of patient safety. It is a common and risky condition, but it is not the norm across patients and hospitals. Responsibility for its use is shared among many hospital staff. Approximately one in five people discharged from the hospital experienced an adverse event that prevented them from using the hospital. These conditions lead to high and unnecessary medical costs. New data suggest that providing discharge samples may reduce the number of post-discharge AEs and readmissions. Randomized controlled trials are currently ongoing to evaluate the characteristics of care transitions. These studies will be conducted over several years and will help us determine whether improving exit procedures and content is a way to improve quality. The Clinical Transformation Test (CTM) has been shown to be a valid and reliable measure of the quality of care transformation in the Indian setting. Additionally, patients can be transitioned to care using a simple three-point response system. The discriminative ability of the Marathi version of the scale should be further tested in future studies.

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