

Evaluating the validity and reliability of the V-scale instrument (Turkish version) used to determine nurses' attitudes towards vital sign monitoring

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Abstract

Aim: The aim of this study was to determine the validity and reliability of the Turkish version of the V-scale, which measures nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration.

Methods: This validity and reliability study was conducted at a tertiary hospital in Ankara, Turkey, in 2016. A total of 169 ward nurses participated in the study. Exploratory factor analysis, Cronbach's alpha coefficient, and the intraclass correlation coefficient were used to determine the validity and reliability of the scale.

Results: A 5-factor, 16-item scale explained 60.823% of the total variance according to the validity analysis. Our version matched the original scale in terms of the number of items and factor structure. Cronbach's alpha coefficient of the Turkish version of the V-scale was 0.764. The test-retest reliability results were 0.855 for the overall intraclass correlation coefficient, and the t-test result was $P > 0.05$.

Conclusion: The V-scale is a reliable and valid instrument to measure Turkish nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration.

KEYWORDS

attitude, deterioration, nurses, reliability, validity, vital signs monitoring

SUMMARY STATEMENT

What is already known about this topic?

- Detecting, interpreting, and evaluating vital signs play a crucial role in determining patient deterioration.
- Neglecting an urgent and appropriate response to patient deterioration can cause increased morbidity, mortality, costs, and admissions to intensive care units.

What this paper adds?

- The validity and reliability of the Turkish version of the V-scale are at acceptable levels.
- The V-scale-TR is a usable and suitable tool for determining Turkish nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration.

The implications of this paper:

- Both national and international studies are needed to determine nurses' attitudes towards the monitoring of vital signs to reduce patient deterioration.

1 | INTRODUCTION

Patient deterioration has been described as “an evolving, predictable and symptomatic process of worsening physiology towards critical illness.” Neglecting an urgent and appropriate response to patient deterioration can cause increased morbidity, mortality, costs, and admissions to intensive care units. Patient deterioration is usually detected through the accurate measurement and interpretation of vital signs by nurses among the various health care professionals. Therefore, their vigilance and appropriate response to deterioration are important for the health of the patients (Lavoie, Pepin, & Alderson, 2016; Tarassenko, Hann, & Young, 2006).

Detecting, interpreting, and evaluating vital signs play a crucial role in determining patient deterioration (Chua, Mackey, Ng, & Liaw, 2013). Researchers have reported that nurses documented vital signs insufficiently and that respiratory rate was the least documented vital sign (Chen et al., 2009; Hillman & MERIT-Study-Investigators, 2005; VanLeuvan & Mitchell, 2008). However, the respiratory rate is generally the first indication of patient deterioration (Sharpley & Holden, 2004), and respiratory failure is the most important reason for admission to the intensive care unit (Jonsson, Jonsdottir, Möller, & Baldursdottir, 2011).

Recent studies have demonstrated that nurses need training on recognizing, responding to, and reporting patient deterioration (Chua et al., 2013; Liaw et al., 2016). A study of nurses, doctors, and health care students found that cardiac arrest rates were reduced following a course on recognizing deterioration (Tume, Sefton, & Arrowsmith, 2014). It follows that when the attitudes of nurses towards vital signs monitoring are determined, comprehensive training programmes can be organized, and thus adverse events can be reduced. However, an instrument to measure nurses' attitudes towards vital signs monitoring is not currently available in Turkey. The only instrument available to determine nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration is the V-scale, which was developed and validated by Mok, Wang, Cooper, Ang, and Liaw (2015). Having such a valid and reliable tool associated with patient care may contribute to improving health care quality. As Mok et al. (2015) noted, determining nurses' attitudes towards vital signs monitoring may lead to the establishment of evidence-based strategies to increase the role of nurses in detecting and reporting deterioration. The purpose of this study was to determine the validity and reliability of a Turkish version of the V-scale.

2 | METHOD

2.1 | Settings and participants

This study was conducted in June to July 2016 with nurses working at the medical and surgical clinics of a university hospital in Ankara, Turkey. It has been suggested that the sample size should be 5 to 10 times the number of scale items in validity and reliability studies (Akgul, 2003). The V-scale has 16 items; therefore, study sample size was set as at least 10 times the number of items in the V-scale ($16 \times 10 = 160$). With an allowance, the possibility of data loss the number of samples was set at 169.

2.2 | Translation

The translation process of the V-scale instrument was conducted by taking into account Aksayan and Gozum's (2002, 2003) guidelines for the transcultural adaptation of scales. Based on these guidelines, a translation and back-translation process was performed first to develop the Turkish version of the V-scale. Four language experts conducted the translation and back-translation process. The scale was first translated into Turkish from English separately by 2 independent bilingual language experts, and similarities or inconsistencies between the original scale and the Turkish translations were evaluated by the

investigator. The investigator created a common Turkish text of the scale from the translated scales, making changes in some words and phrases in terms of language equivalence and appropriateness of meaning. Thereafter, the Turkish text was translated to English separately by 2 independent bilingual language experts who were not aware of the content of the original scale. These 3 texts, ie, the original V-scale, the version translated into Turkish for the V-scale, and the version retranslated into English for the V-scale, were compared and evaluated by the author and 2 experienced doctoral nursing researchers. Finally, the Turkish form of the V-scale (V-scale-TR) was determined to be similar to the original scale and was considered ready for the collection of data.

2.3 | Instrument

The V-scale was developed by Mok et al. (2015) in Singapore. Its purpose is to measure nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration. There are 16 items in 5 subscales of the scale: workload (4 items), technology (4 items), communication (2 items), knowledge (3 items), and key indicators (3 items). The Cronbach's alpha coefficient of the original scale was 0.71. The 5-point Likert scale statements used include "1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree." All items, except items 5, 8, and 9, are negative and scored in reverse. The total score ranges between 16 and 80. A low score indicates a negative attitude, and a high score indicates a positive attitude towards vital sign monitoring.

2.4 | Data collection

We cooperated with the nurse in charge of the clinics to collect data from the nurses. The V-scale-TR was distributed to the nurse in charge of the clinics in envelopes and collected in sealed envelopes over 1 week. Each envelope contained an informed consent form and the V-scale-TR. Data were collected from a total of 169 nurses. The retest was performed 2 weeks after the first test using the same data collection method. Thirty of the nurses responded to the retest.

2.5 | Ethical considerations

We obtained permission from the authors who developed the scale to conduct this validity and reliability study of this scale. The study was approved by the ethics committee of a university in Ankara. Permission was also obtained from the hospital and nurses to perform this study. The nurses were informed before they provided informed consent that this study was conducted on a voluntary basis and that the data would be used anonymously in scientific publications.

2.6 | Statistical analysis

All analyses were performed using SPSS version 21.0 (IBM Corporation, Armonk, NY, USA). We used an exploratory factor analysis (EFA) with Varimax rotation to determine the validity and factor structure of the V-scale-TR. The Kaiser-Meyer-Olkin (KMO) test was used to evaluate the adequacy of the sample size, and the Bartlett test of sphericity was used to determine whether the variables were

correlated with each other. KMO values less than 0.50 indicate that the sample size is not adequate to conduct validity analyses (Esin, 2014). We therefore accepted a KMO > 0.50 and $P < 0.05$ as adequate for the significance of the Bartlett test of sphericity.

An item factor loading of at least 0.32 is recommended (Yong & Pearce, 2013). Therefore, we considered factor loadings higher than 0.32 to be significant in the EFA. Factor loadings of the V-scale-TR items were found to be higher than 0.50. Cronbach's alpha coefficient was calculated to determine the internal consistency of the items. Intraclass correlation coefficient (ICC) and a paired sample t-test were used as reliability analyses to determine the consistencies between the test and retest.

3 | RESULTS

3.1 | Sample characteristics

The mean (SD) and range of the nurses' age was 29.47 (5.208; 21–49) years; their professional experience duration was 6.58 (5.215) years; 94.1% were women; 95.9% had a bachelor's degree, and the remaining nurses had a master's degree.

3.2 | Validity

An EFA was used to determine the construct validity of the V-scale-TR. The KMO value was 0.686, and the Bartlett's test of sphericity result was $P < 0.001$. These results indicate that the sample size was sufficient to perform the factor analysis. Principal component analysis and varimax rotation with Kaiser normalization were used for the EFA. Similar to the original scale, the V-scale-TR exhibited a 5-factor solution with eigenvalues exceeding 1 (Table 1). The 5-factor structure explained 60.823% of the total variance of the scale. Table 1 presents the factor loadings of the scale following the EFA. Factor loadings of all items were significant and ranged from 0.507 to 0.881 and presented in bold font.

3.3 | Reliability

Cronbach's alpha coefficient was used to determine the internal consistency of the items. The mean item score according to the dimensions of the scale and the Cronbach's alpha values are presented in Table 2. The overall Cronbach's alpha coefficient of the scale was 0.764. Cronbach's alpha coefficient values of the subscales ranged from 0.460 to 0.743. ICC and a paired samples t-test were used to determine the consistency between the test and retest. The ICC was

TABLE 1 Factor loadings of the Turkish version of the V-scale ($n = 169$)

| No | Items | Factor Loadings ^a | | | | |
|-------------------------------|--|------------------------------|--------------|--------------|--------------|--------------|
| | | 1 | 2 | 3 | 4 | 5 |
| Factor 1: Workload | | | | | | |
| 1 | It is time-consuming to perform vital signs monitoring. | 0.797 | -0.075 | 0.126 | -0.101 | 0.024 |
| 2 | Vital signs monitoring is a boring task. | 0.840 | 0.119 | 0.117 | 0.035 | 0.108 |
| 3 | Complete and accurate vital signs monitoring is neglected due to time constraints. | 0.559 | 0.004 | -0.024 | 0.269 | 0.037 |
| 4 | I feel overwhelmed trying to complete the different frequency of vital signs collection (ie, hourly, 2-hourly, 4-hourly, etc.) of my patients. | 0.750 | 0.188 | -0.074 | 0.150 | 0.021 |
| Factor 2: Technology | | | | | | |
| 13 | Respiratory rate value is usually estimated for stable patients during routine vital signs monitoring. | 0.003 | 0.672 | -0.061 | 0.174 | 0.083 |
| 14 | Electronic vital signs monitoring results in irregular monitoring (ie, counting) of respiratory rate. | 0.019 | 0.553 | -0.040 | 0.080 | 0.373 |
| 15 | The use of pulse oximetry to monitor spO ₂ will reduce the need to count respiratory rate. | 0.101 | 0.618 | 0.322 | 0.011 | -0.083 |
| 16 | I usually record respiratory rate as standard rate between 12 and 20/min if spO ₂ is within normal range. | 0.107 | 0.814 | 0.087 | 0.072 | 0.034 |
| Factor 3: Communication | | | | | | |
| 8 | I am confident to report deteriorating vital signs in a way that will get team doctor /RN in-charge to review the patient. | 0.065 | 0.121 | 0.881 | 0.232 | 0.050 |
| 9 | I will repeatedly inform the team doctor/RN in-charge on vital sign changes if no prompt actions are acted on. | 0.034 | 0.014 | 0.869 | 0.259 | 0.120 |
| Factor 4: Knowledge | | | | | | |
| 5 | I can relate vital signs readings to physiology and pathophysiology of presenting diseases. | 0.014 | 0.032 | 0.271 | 0.613 | 0.055 |
| 6 | My knowledge in interpreting vital signs to identify clinical deterioration is limited. | 0.150 | 0.165 | 0.327 | 0.720 | -0.034 |
| 7 | Changes in vital signs were not interpreted accurately by nurses (ie, absence or delay of appropriate nursing actions). | 0.142 | 0.133 | 0.002 | 0.834 | 0.064 |
| Factor 5: Key indicators | | | | | | |
| 10 | SpO ₂ is a more reliable indicator in reflecting early signs of respiratory dysfunction than respiratory rate. | -0.030 | -0.010 | 0.141 | 0.087 | 0.655 |
| 11 | Blood pressure is often the first parameter that reflects abnormality when a patient deteriorates. | 0.145 | 0.090 | -0.109 | 0.007 | 0.767 |
| 12 | Respiratory rate value is the least important sign of deterioration. | 0.088 | 0.292 | 0.172 | -0.056 | 0.507 |
| % of variance (Total: 60,823) | | 23.54 | 12.24 | 10.92 | 7.29 | 6.82 |
| Eigenvalues | | 3.766 | 1.959 | 1.747 | 1.167 | 1.092 |

Significant factor loadings were presented in bold font.

^aExtraction method: principal component analysis. Rotation method: varimax with Kaiser normalization.

TABLE 2 Internal consistency of the Turkish version of the V-scale ($n = 169$)

| Subscales | Mean | SD | Cronbach α |
|----------------|------|-------|-------------------|
| Workload | 3.82 | 0.829 | 0.743 |
| Technology | 3.76 | 0.790 | 0.651 |
| Communication | 4.47 | 0.782 | 0.901 |
| Knowledge | 4.19 | 0.648 | 0.696 |
| Key indicators | 3.41 | 0.646 | 0.460 |
| Total | 3.93 | 0.459 | 0.764 |

Abbreviation: SD, standard deviation.

0.855 for the scale. Table 3 presents the results of the t-test performed to evaluate the test and re-test. Based on the t-test results, there was no statistically significant difference between the 2 measurements ($P < 0.05$).

4 | DISCUSSION

The V-scale is a tool to measure nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration. To the best of our knowledge, this is the first study for determining the Turkish version of the V-scale. In this study, translation and back-translation processes were carried out; EFA was performed for the validity analysis; and the internal consistency analysis, test-retest reliability, and paired samples t-test were used as reliability analyses for adapting the V-scale into Turkish.

4.1 | Validity

The V-scale-TR was found to have 5 subscales and 16 items based on the EFA. These 5 subscales explained 60.823% of the total variance of the scale. It is accepted that the scale should explain at least 50% of the total variance (Beavers et al., 2013). The 5-factor structure of the original scale explained 56.27% of the total variance, and in this regard,

TABLE 3 Item differences between the test and re-test

| Number of Items | t | P |
|-----------------|--------|-------|
| 1 | -0.812 | 0.423 |
| 2 | -1.000 | 0.326 |
| 3 | 0.583 | 0.564 |
| 4 | -0.841 | 0.407 |
| 5 | 0.902 | 0.375 |
| 6 | 1.278 | 0.211 |
| 7 | 1.278 | 0.211 |
| 8 | 1.533 | 0.136 |
| 9 | 0.571 | 0.573 |
| 10 | 1.352 | 0.187 |
| 11 | 1.943 | 0.062 |
| 12 | 0.348 | 0.730 |
| 13 | -0.304 | 0.763 |
| 14 | -1.663 | 0.107 |
| 15 | 1.000 | 0.326 |
| 16 | 0.328 | 0.745 |

the V-scale-TR was found to be very close to the original scale. It is therefore accurate to state that the V-scale-TR has good validity. The V-scale-TR has 5 factors: workload (4 items), technology (4 items), communication (2 items), knowledge (3 items), and key indicators (3 items).

Although the total number of items and factors of the V-scale-TR matched the original scale, the percentage of the explained total variance of the factors was different. The reason for this difference could be variations in the characteristics of the sample groups.

4.2 | Reliability

A Cronbach's alpha coefficient, which is a criterion of internal consistency, that is less than 0.40 indicates that the scale is "unreliable," between 0.40 and 0.59 indicates "low reliability," between 0.60 and 0.79 indicates "quite reliable," and between 0.80 and 1.00 indicates "high reliability" (Tavsancil, 2002). According to the results, Cronbach's alpha coefficient of the scale is 0.764, which is quite reliable and very close to 0.71, the Cronbach's alpha coefficient value for the original scale. In this study, Cronbach's alpha coefficient of the subscales ranged from 0.460 to 0.901. Cronbach's alpha coefficient of the original scale is between 0.56 and 0.89, and the 2 scales are similar in terms of internal consistency.

Cronbach's alpha coefficient of the "key indicators" subscale (0.460) had a lower value in the range of 0.40 to 0.59. Although this subscale had lower internal consistency, factor loadings were normal. Cronbach's alpha coefficient of the V-scale-TR was also quite reliable. For these reasons, additional procedures were not performed regarding this subscale, and the subscale was retained in the scale.

The answers should be similar and consistent when an instrument is applied to the same individuals at different times to say that it is stable over time (Esin, 2014). Therefore, the test-retest procedure was performed to assess stability of the V-scale-TR. ICC values between 0.50 and 0.75 are considered to indicate moderate reliability, between 0.75 and 0.9 indicate good reliability, and over 0.9 indicate excellent reliability (Koo & Li, 2016). The overall ICC value (0.855) in our study was the same as the original scale and indicated good reliability. This ICC value suggests that participants understand both the test and retest at different times in the same manner. In addition to ICC, a paired sample t-test was also performed to determine the stability over time. No significant difference was found between the test and retest items ($P > 0.05$). Both the ICC and t-test values suggest that participants understand both the test and retest at different times in the same manner.

4.3 | Limitations

This study might have 2 limitations. First, the data were collected based on the participants' self-reports. Some participants may have subconsciously responded in a manner that does not reflect the truth to answer the scale correctly rather than giving their own personal answers. This bias may have affected the reliability of the responses. Second, nurses in Turkey have varying levels of education. However, 95.9% of the nurses in our study had a bachelor's degree, and the remaining nurses had a master's degree. Without a homogeneous (or

balanced) sample including other levels of education, the level of education may have affected the psychometric properties of the scale.

CONCLUSION AND NURSING IMPLICATIONS

To the best of our knowledge, this is the first study to determine the validity and reliability of the V-scale in Turkey. Our findings revealed that the V-scale-TR with 5 dimensions and 16 items is a valid and reliable tool. This scale can be used to determine Turkish nurses' attitudes towards vital signs monitoring and to conduct research studies aimed at improving the quality of patient care. Thus, promoting nurses' attitudes towards vital sign monitoring may be used to increase the establishment of evidence-based strategies matched to local nurses, to detect and report deterioration.

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CONFLICTS OF INTEREST

None declared.

AUTHORSHIP STATEMENT

NE conceived, design, analyzed and interpreted the study. NE is responsible for drafting and revising the manuscript. NE approved the final version of the article.

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