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Research Article

Turkish Validity and Reliability Study of the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool

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What is already known on this topic?

- *Ventilator-Associated Pneumonia (VAP) is a common and serious infection in intensive care units, increasing patient mortality, hospital stays, and healthcare costs.*
- *Preventive measures, including proper patient positioning, oral care, subglottic suctioning, and ventilator circuit management, are essential to reducing VAP risk.*
- *Various tools exist to assess nurses' adherence to these preventive measures, but their validity and reliability need to be confirmed in different healthcare settings.*

What this study adds on this topic?

- *This study validates and confirms the reliability of a Turkish version of the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool.*
- *The tool was refined to a 12-item, three-factor structure, effectively measuring VAP prevention behaviors among intensive care nurses in Türkiye.*
- *The validated tool provides a standardized method to evaluate nursing practices, support training programs, and improve VAP prevention strategies in intensive care units.*

Abstract

AIM: The study aimed to validate and assess the reliability of the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool in a Turkish sample.

METHODS: This cross-sectional, methodological study included 273 intensive care nurses between December 2022 and February 2023. Confirmatory and exploratory factor analyses, as well as reliability analyses, were conducted using SPSS 26 and AMOS 24. Descriptive information and the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool were used to measure validity and reliability.

RESULTS: Exploratory factor analysis reduced the 17-item scale to 12 items. The Kaiser–Meyer–Olkin value was 0.757, and Bartlett's test of sphericity was significant ($\chi^2 = 445.2$, $p < .001$), indicating good construct validity for measuring ventilator-associated pneumonia prevention behaviors. The cronbach alpha of the scale was obtained as 0.745.

CONCLUSION: The Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool is a valid and reliable instrument for the Turkish sample.

Keywords: Intensive care, nurse, prevention, reliability, validity, ventilator-associated pneumonia

Introduction

Mechanical ventilation (MV), commonly used in intensive care units (ICUs), is associated with significant complications, including barotrauma, pulmonary edema, pulmonary embolism, and ventilator-associated pneumonia (VAP) (Bardwell et al., 2020). Ventilator-associated pneumonia is recognized in the literature as the most frequent and fatal hospital-acquired infection among ICU patients (Dat et al., 2022; Fernando et al., 2020). Defined as a nosocomial lung parenchyma infection occurring after 48–72 hours of intubation and MV support, VAP is classified into early-onset (48–72 hours) and late-onset (beyond 96 hours) types (Gürdil Yilmaz & Çam, 2019; Hu et al., 2022;).

The incidence of VAP varies, ranging from 2 to 16 per 1000 ventilator days in global epidemiological studies (Madhuvu et al., 2020; McEnery & Martin-Loeches, 2020). In Türkiye, data from the National Healthcare-Associated Infections Surveillance Network (USHIESA) report VAP incidence between 0.9 and 7.7 per 1000, depending on the ICU type (USHIESA, 2023). Risk factors for VAP include pre-existing conditions, non-aseptic aspiration, MV duration exceeding two days, enteral feeding, inadequate oral care, patient positioning, use of nasogastric tubes, age, and gender (Gönderen & Parlak, 2022;Gürdil Yilmaz & Çam, 2019). Patients with VAP

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experience prolonged ICU and hospital stays, increased antibiotic usage, higher healthcare costs, and elevated morbidity and mortality rates (Fernando et al., 2020; Hu et al., 2022).

As VAP incidence reflects the quality of healthcare and nursing care in ICUs, nurses hold critical responsibilities in its prevention (Álvarez-Lerma & García, 2018). In 2011, the U.S. Institute for Healthcare Improvement introduced care bundles to mitigate complications associated with MV. These bundles include essential practices such as elevating the head of the bed (30°-40°), daily sedation interruptions, assessing extubation readiness, and providing prophylaxis for gastric ulcers and deep vein thrombosis (Candaş & Gürsoy, 2017; Gönderen & Parlak, 2022).

The purpose of this study is to test the validity and reliability of the Turkish version of the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool developed by Kwak and Han (2022). This tool is considered a significant instrument for assessing and enhancing the preventive behaviors of nurses working in ICUs concerning VAP. In this context, the findings of this study are anticipated to make valuable contributions to the Turkish healthcare system and ICU nursing practices. A validated and reliable measurement tool will provide standardization in evaluating nurses' preventive behaviors, facilitating the development of evidence-based interventions and the enhancement of educational programs aimed at preventing VAP. Consequently, this study aims to improve patient safety and the quality of care by reducing VAP incidence and optimizing nursing practices in intensive care settings.

Research Questions

1. Is the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool a reliable scale?
2. Is the Ventilator-Associated Pneumonia Preventive Behavior Measurement Tool a valid scale?

Methods

Research Design

The research was performed cross-sectional and methodologically.

Sample

The study was performed with nurses working in the adult and pediatric ICUs of a training and research hospital in Sakarya between December 2022 and February 2023. In the sample calculation, the conditions for factor analysis were considered, and the ideal group size for factor analysis should be between 10 and 25 times the number of items in the instrument. (Alpar, 2014). Considering that the scale consists of 17 items and accounting for potential sample loss, the study was completed with 273 nurses working in ICUs. A total of 273 nurses were included in the study because it was planned to use different samples for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) regarding the number of scale items.

The inclusion criteria are as follows: a) becoming a graduate nurse, b) working in the ICU, and c) participating in the study voluntarily.

After finalizing the scale, a pilot study should be conducted with the recommended number of participants to assess the comprehensibility of the questions (Seçer, 2018). The pilot study was conducted with 30 individuals of different educational levels from a target group different from the research sample. Since each item was found to be understandable, no changes were made to the scale.

Data Collection Tools

Descriptive Information Form

It includes 17 questions about age, gender, professional and intensive care working duration, intensive care experience, etc.

Ventilator-Associated Pneumonia Preventative Behavior Measurement Tool

The VAP Preventive Behaviour Measurement Tool is a psychometric instrument designed to assess the efficacy of preventive behaviors. The items of the VAP Preventive Behaviour Measurement Tool, which were developed by Kwak and Han, are four-point Likert-type items. A greater overall score reflects a higher adherence to behaviors that prevent VAP.

The scale consists of 17 items distributed across seven factors: aspiration prevention, oral care, subglottic suctioning, spontaneous awakening and breathing trials, ventilator circuit management, aspiration system management, and standard precautions. It serves as a tool to evaluate the implementation of VAP prevention measures in ICUs. Additionally, the scale aids in identifying critical areas requiring preventive interventions and highlights opportunities for improvement (Kwak & Han, 2022). It was reported that the scale developed by Kwak and Han had no cut-off score, and that Cronbach's α value was 0.80. In this research, the Cronbach α coefficient for the sample group was 0.74.

Procedure

Language Validity

Two professional translators translated the scale from the original Korean language into Turkish and English and back-translated it. Then, two faculty members who specialized in nursing principles and pediatric nursing, who knew English well, separately translated the scale from English into Turkish. Later, the researchers assessed these translations, and the Turkish version of the scale was rearranged. An independent linguist translated it back into English. The translated versions were then evaluated by an expert panel, which included a nurse, an English language specialist, and a leading researcher. These were assessed for grammatical accuracy and the correctness of expressions. The translation phase was finalized after the corrections.

Content Validity

The scale was reviewed by 10 experts specializing in nursing and intensive care to ensure content validity. These experts

evaluated each item's relevance and clarity, rating them on a scale of 1–4 (1 = not relevant, 2 = slightly relevant, 3 = relevant, 4 = completely relevant) and provided feedback and suggestions. Based on their input, the items were revised accordingly.

The content validity index (CVI) was calculated to assess the experts' feedback. Using the Davis technique, the number of experts who rated each item as "relevant" or "The item should be slightly revised" was divided by the total number of experts to determine the CVI for each item. The content validity ratio (CVR) for each item was then computed (Alpar, 2014).

For all 17 items, the 10 experts rated them as either "relevant" or "The item should be slightly revised". It is recommended in the literature that the number of experts be at least five (Alpar, 2022). Given that there were 10 experts, items with a CVR of 1.0 were considered valid at a 5% significance level (Alpar, 2014; Yeşilyurt & Çapraz, 2018). The study found that the mean CVI and CVR were both 1.0, indicating that the scale's content validity was statistically significant, with the CVI exceeding the CVR.

Statistical Analysis
Data were evaluated using the Statistical Package for Social Sciences version 26.0 software (IBM SPSS Corp.; Armonk, NY, USA) and AMOS 24.0. Descriptive statistics (*n*, %) were presented for categorical variables. In evaluating the scores given by specialists, CVI and CVR were computed. Exploratory factor analysis and CFA were carried out for the scale's validity. In reliability analyses, Cronbach's α coefficient, split-half, and item-scale total score correlation analyses were performed.

Ethical Considerations
After acquiring the permission of the scale owner via e-mail for conducting the validity and reliability studies in Turkish, the approval of Sakarya University Faculty of Medicine Ethics Committee (Approval no: E.312, Date: November 7, 2022) and written informed consent from the hospital management and nurses were obtained. After explaining the study's aim to nurses, data were collected in line with the principle of volunteering.

Results

Participants' Descriptive Features
The sociodemographic distribution of the study was as follows. Two separate samples were studied for EFA (*n* = 136) and CFA (*n* = 137) in the construct validity phase. The reliability analyses were performed using the sum of both samples (*n* = 273).

The EFA showed that 72.1% of the participants were female, 81.6% were university graduates, 55.1% were single, 82.4% worked in shifts, 24.3% worked in the anesthesia ICU, 80.9% did not have an ICU certificate, 53.7% had received VAP training, and 61% provided nursing care to patients with VAP diagnosis (Table 1).

The CFA determined that 78.8% of the participants were female, 61.3% were university graduates, 53.3% were married, 66.4% worked in shifts, 34.3% worked in the anesthesia ICU, 52.6% did not have an ICU certificate, 65% had received VAP training, and 76.6% provided nursing care to patients with VAP diagnosis (Table 1).

Construct Validity
Both EFA and CFA were employed to assess the construct validity of the scale.

Exploratory Factor Analysis
Initially, EFA was used to explore the scale's construct validity, employing the "principal components method" for factor extraction. The Kaiser–Meyer–Olkin (KMO) test was conducted to evaluate the adequacy of the sample for factor analysis, while Bartlett's test assessed whether factor analysis was appropriate for the scale. Items 3, 5, 12, 13, and 17, with factor loadings below 0.300 in the EFA of the 17-item scale, were excluded, resulting in a final analysis of 12 items (Seçer, 2018). As indicated in Table 2, the KMO value for the 12-item structure was 0.757, suggesting that the sample size was sufficient for factor analysis (Alpar, 2014).

Bartlett's test of sphericity confirmed a significant correlation between variables, supporting the suitability of the scale for factor analysis ($p < 0.01$). The analysis revealed that all items loaded conceptually into three distinct subscales. Factor-1 accounted for 31.71% of the total variance, Factor-2 accounted for 14.53%, and Factor-3 explained 9.75%. Together, these three subscales accounted for 56.00% of the total variance (Table 2).

Confirmatory factor analysis
The study involved analyzing a measurement model to validate the structure of the 12-item scale with three factors. The analysis confirmed that the model fit adequately, and the structure with 12 items and three subscales was finalized. The validated measurement model is illustrated in Figure 1.
Figure 1 displays the measurement model, including the items and the standardized regression coefficients (factor loadings) for the paths indicated by the one-way arrows. The results demonstrated that the items were appropriately assigned to their respective subscales, with factor loadings ranging from 0.29 to 0.86 (Figure 1).

The CFA found the fit index values as follows: χ^2/SD = 1.812, root mean square error of approximation (RMSEA) = 0.077, goodness of fit index (GFI) = 0.897, comparative fit index (CFI) = 0.885, Tucker–Lewis index (TLI) = 0.852, adjusted GFI (AGFI) = 0.850, and standardized root mean square residual (SRMR) = 0.069. Accordingly, the fit index values of the scale were found to be at excellent or acceptable levels (Karagöz, 2019).

Reliability Studies of the Scale
Within the scope of reliability analysis, Cronbach's alpha coefficient, split-half, Spearman–Brown, and Guttman split-half tests were performed in the total of both samples.

In the research, Cronbach's α values of the scale were obtained as 0.733 for the seven-item factor one, 0.817 for the three-item factor two, 0.585 for the two-item factor three, and 0.745 for the overall scale, respectively. In the split-half analysis, Cronbach's α coefficient was 0.679 in the first half and 0.620

Table 1.
Demographic Characteristics of Participants (N : 273)

Variables	AFA (*n* = 136) *n* (%)	DFA (*n* = 137) *n* (%)
Gender		
Female	98 (72.1)	108 (78.8)
Male	38 (27.9)	29 (21.2)
Education		
High school	25 (18.4)	17 (12.4)
Associate degree Bachelor's degree	111 (81.6)	84 (61.3)
Graduate	–	36 (26.3)
Marital status		
Married	61 (44.9)	73 (53.3)
Single	75 (55.1)	64 (46.7)
Mode of operation		
Day	24 (17.6)	46 (33.6)
Day–night	112 (82.4)	91 (66.4)
The intensive care unit being studied		
Anesthesiology	33 (24.3)	47 (34.3)
Internal	17 (12.5)	12 (8.8)
Breast	19 (14.0)	8 (5.8)
Child	4 (2.9)	27 (19.7)
Neurology	17 (12.5)	4 (2.9)
Brain surgery	1 (0.7)	2 (1.5)
General	23 (16.9)	25 (18.2)
Surgical	1 (0.7)	6 (4.4)
KVC	5 (3.7)	2 (1.5)
Coronary	7 (5.1)	4 (2.9)
Thoracic surgery	9 (6.6)	–
ICU nursing certificate		
Yes	26 (19,1)	65 (47.4)
No	110 (80.9)	72 (52.6)
VAP training		
Yes	73 (53.7)	89 (65.0)
No	63 (46.3)	48 (35.0)
The status of providing nursing care to a patient diagnosed with VAP		
Yes	83 (61.0)	105 (76.6)
No	53 (39.0)	32 (23.4)
Age (year) M ± SD (min–max)	27.33 ± 4.60 (22–44)	30.93 ± 6.68 (23–49)
Professional experience (year) M ± SD (min–max)	5.22 ± 4.96 (1–26)	8.58 ± 6.89 (1–26)
Experience in intensive care (year) M ± SD (min–max)	2.80 ± 2.44 (1–12)	5.45 ± 5.05 (1–25)
Weekly working hours M ± SD (min–max)	46.00 ± 7.62 (32–72)	47.86 ± 10.34 (36–96)
Number of patients cared for in one shift M ± SD (min–max)	2.48 ± 0.95 (2–7)	2.61 ± 1.40 (1–10)

in the second half, the Spearman–Brown coefficient was 0.649, and the Guttman split-half coefficient was 0.636 (α > 0.600) (Alpar, 2014). A significant positive correlation was detected between the two halves (r = 0.480; p < .05) (Table 3).

Item–Total Score Correlation Analysis

Item–total score analysis is an additional method recommended for assessing the validity and reliability of the scale. This analysis determines whether the individual items effectively measure the intended variable. Thus, the correlation between the scores acquired from the scale items and the scale total score is revealed. In the literature, it is recommended that the correlation coefficient be 0.30 and higher (Devellis & Thorpe, 2022). It is emphasized that these values should be as close to 1.0 as possible and positive (Jonhson & Christensen, 2014). The current research determined that the values were higher than 0.30 and there was a positive correlation (Table 3).

The validity and reliability analysis concluded that the scale consists of 12 items and 3 subscales. Scores on the scale range from a minimum of 12 to a maximum of 48. A higher score indicates a greater level of compliance with VAP preventive behaviors.

Discussion

Mechanical ventilation represents an effective intervention method to save the lives of critically ill patients and is commonly utilized in ICUs. There are various strategies for the prevention and control of VAP in the clinic, such as prevention packs, β-lactam antibiotics, and probiotics (Wu et al., 2019). Ventilator-associated pneumonia leads to mortality and morbidity, prolonged hospital stays, and increased economic and psychological costs for patients and their families. Over the past two decades, numerous guidelines have been suggested to decrease the incidence of VAP. The necessity of combining interventions for them to be helpful has been scientifically proven. In 2016, the UK Intensive Care Society suggested a package called the "recommended bundle of interventions for the prevention of VAP," which included raising the bed head, interrupting daily sedation and evaluating the readiness for extubation, using subglottic secretion drainage, avoiding planned ventilator circuit changes, and peptic ulcer disease (PUD) prophylaxis. Additionally, measures such as mechanical tooth brushing, evaluation of endotracheal tube pressure, and location of the mechanical ventilator filter are low-cost measures that can be easily used (Branco et al., 2020; Mastrogianni et al., 2023).

It is known that nursing care practices such as aspiration according to the needs of the patient, position change every 2 hours, oral care every 4 hours help to reduce VAP (Duraivelu et al. 2024). In a study, it was emphasized that nurses having undergraduate and higher education, duration of professional experience in intensive care, the number of patients per nurse, especially in the night shift, and the frequency of oral care reduced the incidence of VAP (Yin et al. 2022). In order for care to be successful, it is important to ensure that nurses determine what needs to be improved, to encourage them to think about the care provided to critically ill patients and to update

Table 2.
Results of Explanatory Factor Analysis of VAP Preventative Behavior Measurement Tool (N = 136)

	Subscales		
Items	**F1**	**F2**	**F3**
Item 4	0.73		
Item 11	0.73		
Item 2	0.68		
Item 1	0.64		
Item 6	0.56		
Item 7	0.49		
Item 8	0.46		
Item 15		0.81	
Item 14		0.73	
Item 16		0.66	
Item 9			0.91
Item 10			0.90
Explained variance (%)	31.72	14.54	9.75
Eigenvalues (Λ)	3.81	1.75	1.17
Explained total variance (%) = 56.01			
KMO coefficient = 0.76, Bartlett test χ^2 (66) = 445.292			

their knowledge level with continuous training (Niedzwiecka et al., 2019).

Therefore, it is important to evaluate nurses' knowledge, attitudes, and behaviors to prevent VAP in ICUs. The present study concluded that this scale, which was adopted in this direction, would fill a large gap in the field and could measure the degree of implementing VAP measures in the ICU. It was considered that it would be meaningful to show the importance of VAP preventive actions and examine them to improve their implementation.

Content, construct, and predictive validity are examined to test the scale's validity. To assess the relevance of the VAP scale's items, the content validity was tested by submitting it to expert opinions. Based on the evaluations by experts, the CVR for each item was calculated. Given that there were 10 experts, items with a CVR of 0.62 or higher were deemed to have sufficient content validity (Yeşilyurt & Çapraz, 2018). The average values for the CVI and CVR were both 1.0. With the CVI being equal to or greater than the CVR, the overall scale's content validity was found to be statistically significant.

In evaluating construct validity, factor analysis is carried out to examine under which dimensions the scale items will be collected (Karakoç & Dönmez, 2014). In the current study, both EFA and CFA were conducted to assess construct validity. The KMO test, which evaluates sample size adequacy, and Bartlett's test, which assesses the suitability of the scale for factor analysis, were performed. According to the literature, satisfactory factor analysis requires KMO and Bartlett values greater than 0.5 to ensure sampling adequacy (Alpar, 2014; Kalaycı, 2018). The KMO value of 0.757 obtained in this study indicates a "very good" level of sample adequacy, confirming that the sample size is appropriate for factor analysis.

The literature indicates that factor loadings derived from EFA typically explain between 40% and 60% of the total variance (Alpar, 2014). In this study, the scale accounted for 56.01% of the total variance across all subscales, demonstrating its adequacy.

In the factor analysis conducted to determine which items were loaded on which factors, since the factor loadings of items 3, 5, 12, 13, and 17 were below 0.300, they were removed and analyses were performed on 12 items. For the 5 items removed, opinions were obtained from the scale's authors, and it was approved that the final version of the scale would have 12 items. This made us think that it might have been caused by cultural differences. Therefore, it is expected that validity and reliability values may vary in scale adaptation studies conducted across different cultures.

Confirmatory factor analysis is conducted to assess whether the correlations between items and their respective factors are sufficient (Alpar, 2014). Confirmatory factor analysis is typically recommended following EFA (Boateng et al., 2018). The measurement model designed to validate the 12-item structure was analyzed, and it was confirmed with 12 items and 3 subscales (Figure 1).

To reveal whether the scale's original structure was confirmed in the Turkish population, the CFA result showed a perfect fit

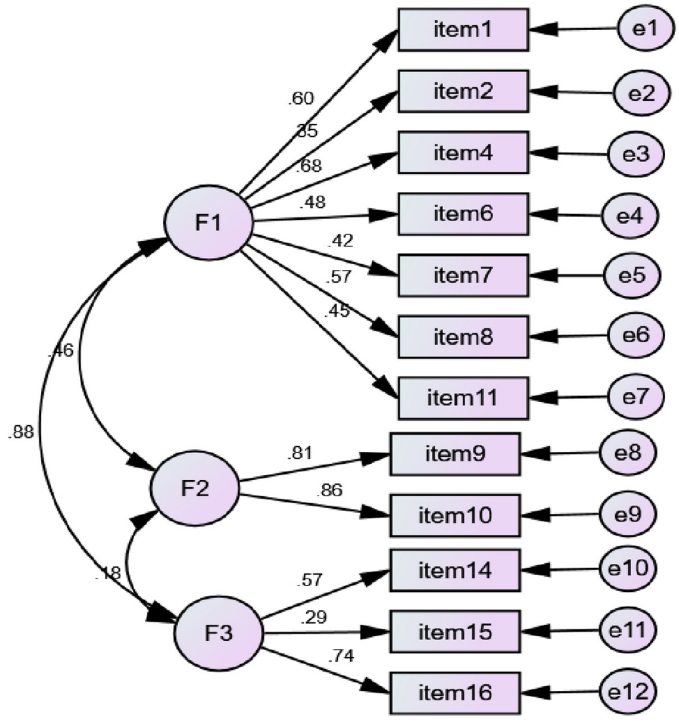

Figure 1.
Confirmatory factor analysis of the VAP preventative behavior measurement tool (N = 137).

between the fit index values of RMSEA, GFI, CFI, TLI, SRMR, and AGFI. As has been previously observed in the literature, an excellent fit is evident (Alpar, 2014; Seçer, 2018; Karagöz, 2019; Erkorkmaz et al., 2013).

For the scale's reliability study, the correlation between two halves was calculated with Cronbach's α and split-half consistency analysis and split-half reliability, the correlation was calculated with the Guttman formula, and the reliability of two halves was calculated with the Spearman–Brown formula (Alpar, 2014; Ercan, 2004). Cronbach's α reliability coefficient was utilized to compute the scale's reliability. It is desired that the reliability coefficient of the measurement tool be as close to 1 as possible. A Cronbach's α coefficient of 0.745 for all scale items is considered reliable (Alpar, 2014; Seçer, 2018). In studies in the literature, Cronbach's α coefficient is mostly used to determine the reliability of scales, and it is recommended to consider values higher than 0.7 (Alpar, 2014). The split-half method divides the form into two equal parts, and after the two halves are simultaneously applied to subjects, it provides a reliability estimate with the correlation between the scores obtained by subjects from the halves. The reliability values higher than $\alpha > 0.600$ indicate that the measurement tool's reliability is good (Table 3).

Item–total score analysis is an additional method recommended for assessing the validity and reliability of the scale. This analysis is used to research whether the scale items measure the desired variable. Thus, the correlation between the scores acquired from the scale items and the total scale score is revealed (Cakmur, 2012). Although a value higher than 0.20 is acceptable in the literature, it is recommended to be 0.30 and above in many studies. It is stressed that these values should be positive and as close to 1 as possible (Jonhson & Christensen, 2014). The current research found the values to be higher than 0.29 and detected a positive correlation (Table 3).

Conclusion and Recommendations

The present research results demonstrated that the Ventilator-Associated Pneumonia Preventative Behavior Measurement Tool was a valid (content and construct) and reliable test for Turkish culture.

As a result of the validity and reliability analyses, it was concluded that the scale comprised 12 items and 3 subscales. The lowest score is 12, and the highest score is 48 on the scale. A high score is interpreted as a high VAP preventive behavior compliance score. It can contribute to the monitoring and treatment of patients on MV in ICUs, aid in the prevention and treatment of VAP, and improve the incidence of hospital-acquired VAP. The VAP preventive behavior scale for intensive care nurses has good reliability, face and content validity in evaluating nurses' knowledge. It can form basis for determining training topics for intensive care nurses. Comparison studies between nurses' knowledge status and patient outcomes can be done. Due to small number of questions included in the scale, it can be easily used in clinical practice. It can also contribute to quality improvement studies in ICUs.

Table 3.
Results of the Reliability Analysis of the Scale and Sub-Dimensions, Correlations of the Item–Total Score, and the Sub-Dimension Total Score (N = 273)

Subscales	Cronbach' α	The First Half of Cronbach's α	The Second Half of Cronbach's α	Spearman–Brown	Guttman Split-Half	Correlation Between Two Halves Scale Total
Total scale	0.745	0.679	0.620	0.649	0.636	0.480
Factor 1	0.733					
Factor 2	0.817					
Factor 3	0.585					
Sub-dimensions	Items	Item–total score correlation (*r*)*		Item–subscale total score correlation (*r*)*		
F1	Item 1	0.487**		0.623**		
	Item 2	0.483**		0.564**		
	Item 4	0.554**		0.674**		
	Item 6	0.484**		0.633**		
	Item 7	0.463**		0.641**		
	Item 8	0.506**		0.641**		
	Item 11	0.444**		0.610**		
F2	Item 9	0.429**		0.920**		
	Item 10	0.474**		0.920**		
F3	Item 14	0.458**		0.732**		
	Item 15	0.424**		0.796**		
	Item 16	0.490**		0.708**		

Note: *Pearson correlation coefficient, **$p < .001$.

Factor 1. Prevention and Management of Aspiration

Raise the bed head at an angle of 30–45 degrees, except for contraindicated patients

Cuff pressure should be maintained at 20–30 cm H_2O

Regularly check the correct positioning of the nasogastric tube

Oral care is done every 4–8 hours

Carry out subglottic secretion suction
(Subglottic secretion: oropharyngeal secretions in the subglottic region above the cuff of the endotracheal tube)

Prior to decuffing an endotracheal tube cuff, ensure that secretions are cleared from the top of the tube cuff before moving the tube or repositioning the patient.

Replace ventilator circuitry when it is visibly dirty or mechanically malfunctioning

Factor 2. Spontaneous Awakening Trials and Spontaneous Breathing Trials

Perform spontaneous awakening trials daily with sedatives off, except for contraindicated patients

Carry out spontaneous breathing trials once a day

Factor 3. Sterilization Management

For patients who use an open aspiration system, use a sterile disposable aspiration catheter and sterile water for each aspiration.

In patients who use a closed aspiration system, a closed aspiration catheter must be used for each new patient.

Follow the aseptic technique when managing the tracheostomy site and replacing the tracheostomy tube

Faktör 1 Aspirasyonun Önlenmesi ve Yönetimi

Kontrendike hastalar dışında, yatak başını 30–45 derecelik bir açıyla kaldırın

Kaf basıncı 20–30 cm H2O'da tutulmalıdır

Nazogastrik tüpün doğru konumlandırıldığını düzenli olarak kontrol edin Ağız bakımı her 4–8 saatte bir yapılır

Subglottik sekresyon emme işlemini gerçekleştirin
(Subglottik sekresyon: endotrakeal tüpün kafının üzerindeki subglottik bölgede orofaringeal sekresyonlar)

Bir endotrakeal tüpün kafını açmadan önce, tüpü hareket ettirmeden veya hastayı yeniden konumlandırmadan önce tüp kafının üstünden sekresyonların temizlendiğinden emin olun.

Ventilatör devresi gözle görülür şekilde kirlendiğinde veya mekanik olarak arızalandığında değiştirin

Faktör 2 Spontane Uyanış Denemeleri ve Spontane Nefes Alma Denemeleri

Kontrendike hastalar dışında, sedatifler kapalıyken her gün spontan uyanma denemeleri gerçekleştirin

Günde bir kez spontan solunum denemeleri gerçekleştirin

Faktör 3 Sterilizasyon Yönetimi

Açık aspirasyon sistemi kullanan hastalarda her aspirasyon için steril tek kullanımlık aspirasyon kateteri ve steril su kullanın.

Kapalı aspirasyon sistemi kullanan hastalarda, her yeni hasta için kapalı aspirasyon kateteri kullanılmalıdır.

Trakeostomi bölgesini yönetirken ve trakeostomi tüpünü değiştirirken aseptik tekniği izleyin.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Committee Approval: Ethics committee approval was obtained from the Sakarya University Faculty of Medicine Ethics Committee (Approval no: E.312, Date: November 7, 2022).

Informed Consent: Written informed consent was obtained from hospital management and nurses who participated in this study.

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