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RESEARCH

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Psychometric properties of End-of-Life Caregiving Experience Appraisal Scale: Iranian critical care nurses

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Abstract

Background: Health care providers should be able to provide good quality end-of-life care. A tool to evaluate the positive and negative consequences of caring for dying patients is warranted.

Aim: The aim of this study was to evaluate the psychometric properties of the Persian version of the End-of-Life Caregiving Experience Appraisal Scale (EOLCAS).

Methods: This research was conducted in two phases. Phase I: The World Health Organization Protocol of forward-backward translation and an expert panel in order to determine face and content validity. Phase II: Survey development with 310 nurses who worked in critical care units, construct validity (construct, convergent and divergent validity), internal consistency (average inter-item correlation, Cronbach's alpha and McDonald's omega) and construct reliability were evaluated.

Results: The exploratory factor analysis showed that the present scale (Persian version) has four factors: *Negative physical-emotional and social consequences*, *transcendental communication*, *information deficits* and *future rumination*, which explained 83.92% of the overall extracted variance. Convergent and divergent validity were confirmed for all factors. The internal consistency and construct reliability were acceptable.

Conclusion: The scale has a multidimensional concept that is sufficiently reliable and the use of the scale would be helpful in measuring consequences of caring for dying patients.

Relevance to clinical practice: This scale makes a significant contribution in that it helps in the recognition of positive and negative consequences of critical care nurses' caring for dying patients.

KEYWORDS

critical care nursing, Iran, psychometrics, terminal care

1 | BACKGROUND

Death is an expected, important and inevitable event in the nursing profession, especially in critical care units, elderly nursing care centres and other units providing end-of-life (EOL) care services.[1,2] Many patients are admitted to critical care units just before the end of their lives in order to receive life-saving and body-function restoring measures; however, because of the inevitable deterioration in the conditions of many patients, the role of nurses may change from life-sustaining activities to EOL nursing care.[3,4] Nurses may express various reactions dealing with death and the caring of dying patients. In other words, daily exposure to death may impact nurses emotionally

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and physically; according to different studies, repeatedly facing death and caring for dying patients have been accompanied by fear and anxiety, depression, emotional fatigue, occupational stress and even burn out.[5,6]

Nurses are more affected when they encounter the death of a particular patient such as the death of a child, friend or colleague, as well as the death of disaster victims.[7,8] However, we should keep in mind that death and EOL care affect nurses in both aspects, negatively and positively.[6]

Dunn et al[9] posited a positive attitude about caring for dying patients among registered nurses so that those who had spent more time with terminally ill patients reported more positive attitudes[9]; however, it was also shown that negative attitudes about caring for dying patients existed among nursing students in Iran.[10] There are studies that mention the positive aspects of providing end-of-life care (EOLC) such as personal growth, improving nurses' capacity to cope and talk about death and positive attitudes towards caring for dying patients and their families.[11-14]

Jang et al[4] in a qualitative study have pointed out one of the positive consequences of caring for dying patients in the intensive care unit (ICU) with a nurse participant stating "I do not think death is the end of life, I think that life is like the driving force and death is something that everyone must experience without any exception, so death is also an extension of life in the end".[4] The results of McAndrew and Leske's[12] study revealed another positive EOL experience among nurses and physicians in ICUs as achieving balance during EOL decision-making.[12]

Obviously, investigating the consequences of caring for dying patients is integral for nurses who work in critical care units because they encounter patient death every day. At this time, there is no validated instrument in Persian language, which can assess inclusively all positive and negative consequences of providing EOLC for critical care nurses, so development of such a tool seemed necessary.

On reviewing existing resources, a 32-item tool to assess the positive and negative effects of caring for dying patients specifically for nurses, entitled "End-of-Life Caregiving Experience Appraisal Scale," designed by Lee et al[15] was identified. To design this tool, initially, based on a systematic review of 35 related studies, a questionnaire was arranged with 32 items. Its content validity was examined by both nurse scholars and clinicians using a content validity index (CVI). In order to determine the construct validity, factor analysis was used based on the views of 175 nurses who provided care for dying patients.

This study was designed with the aim of determining the psychometric properties of the Persian version of "End-of-Life Caregiving Experience Appraisal Scale" (EOLCAS), keeping in mind that this tool has not been translated into any language yet. By using the results of this study, access to a tool to facilitate the understanding of the consequences of caring for dying patients was provided. This could be effective in planning and improving the quality of care for dying patients, as well as providing the necessary support for nurses working in this field.

WHAT IS KNOWN ABOUT THIS TOPIC?

- Investigating the effects and consequences of caring for dying patients is especially important for critical care nurses.
- There are currently a number of tools that mainly focus on the negative and unpleasant outcomes of this phenomenon.

WHAT THIS PAPER ADDS?

- A tool to assess the positive and negative consequences of caring for dying patients.
- The Persian version of EOLCAS is sufficiently valid and reliable; use of the scale would be helpful to assess positive and negative consequences of caring for dying patients.
- Validation of this questionnaire in other languages and nations is necessary.

2 | METHOD

2.1 | Overview

Evaluation of "End-of-Life Caregiving Experience Appraisal Scale" took place in two phases to test psychometrics and the feasibility of the scale.

2.2 | Phase I

Written permission for the use of the EOLCAS was obtained from the developer of the scale, Professor Juhe Lee. The World Health Organization protocol of forward-backward translation technique was used for translating the scale from English into Persian.[16] Two English-Persian translators were invited to independently translate the EOLCAS. An expert panel, consisting of some of this paper's authors as well as two professional translators, assessed and unified the two translations and constructed a single Persian translation of EOLCAS. Thereafter, a Persian-English translator was asked to back-translate the Persian EOLCAS into English. This English translated version of the EOLCAS was sent to Professor Lee, for confirmation of the correctness of translations and confirming the similarity of the translated English EOLCAS with its original. All comments are included in the final version of the scale.

2.2.1 | Face validity

At this stage, the scale was given to 15 nurses who worked in a critical care unit. They were asked to comment on the appropriateness of the appearance, degree of clarity and ambiguity of the selected words and the rationality of the sequence of the items in order to achieve the

goals of the scale. The viewpoints of this group were included in the final version.

2.2.2 | Content validity

Quantitative content validity was assessed by calculating the content validity ratio (CVR) and CVI for the items. Fifteen nursing specialists were used for face validity, and asked to rate the essentiality of the EOLCAS items on a three-point scale as follows: Not essential: 1; Useful but not essential: 2; and Essential: 3.[17,18] The CVR was calculated using the following formula: CVR = (n_e − [N/2])/(N/2). In this formula, *N* and n_e are respectively equal to the total number of experts and the number of experts who rate the intended item as "Essential." When the number of panellists is 15, the minimum acceptable CVR is equal to 0·49.[19] These 15 nurses were excluded from the main sample (310 nurses).

The CVI shows the degree to which the items of the intended scale are relevant and CVI can be calculated for each item of the scale (Item-level or I-CVI) and also for all of the items (Scale-level or S-CVI). Thus, we asked the same 15 panellists to rate the relevance of the EOLCAS items on a four-point scale from 1 to 4. For instance, the four points for rating the relevance of the items were "Not relevant," "Somewhat relevant," "Quite relevant" and "Highly relevant." They were scored as 1, 2, 3 and 4, respectively. The CVI of each item was calculated by dividing the number of panellists who had rated that item as 3 or 4 by the total number of the panellists. Jay Lynn et al[20] noted that when the number of panellists is equal to 15, the items that acquire an I-CVI value of 0·79 or greater are considered appropriate.

2.3 | Phase II

2.3.1 | Survey development and construct validity and reliability

Consistent with this study's aim to provide an efficient, reliable and valid tool for collecting data about the EOL caregiving experience, we wanted to create a survey that was straightforward to understand and practical to administer while maximizing the usefulness of the data collected with it.

This survey was conducted on 310 nurses who worked in critical care units (ICU, CCU and an emergency unit) at six hospitals under the supervision of Qazvin University of Medical sciences, Iran, from February to June 2017. Participants were enrolled to the study using convenience-sampling method. MacCallum et al,[21] recommended that the sample size should be at least 200 cases for psychometric studies. The nurses met the following inclusion criteria: (a) able to read and write Persian, (b) no co-morbid psychiatric problems (e.g. schizophrenia, post-traumatic stress or other diagnosed anxiety disorder, dementia, major depressive disorder) and (c) have at least 6 months experience in a critical care unit. The rationale for excluding nurses who reported a history of clinical depression and/or anxiety disorders was to ensure that nurses were free of psychiatric impairment. Nurses were also excluded if they self-reported potential confounding concurrent conditions such as drug or alcohol abuse or addiction. All of the participants completed two questionnaires: (a) Basic questions regarding demographic and work-related variables with seven items. (b) The End-of-Life Caregiving Experience Appraisal Scale (EOLCAS) with 32 items. Data were collected in a single stage, by a paper-and-pencil method. Participants provided informed consent and deposited completed questionnaires into a closed box. The institutional ethical review team approved the research prior to implementation.

2.4 | Construct validity

The construct validity of the scale was evaluated using maximum likelihood exploratory factor analysis (MLEFA) with varimax rotation. In the first step, the latent factors were extracted based on Horn's parallel analysis.[22] Confidence intervals (CIs) were estimated for each eigenvalue based on CI 95 width (*z*: 1.96), each observed eigenvalue, and the sample size (*n*).[23] The Kaiser–Meyer–Olkin test of sampling adequacy and the Bartlett test were implemented. The presence of a single item in the factor based on the formula CV = 5.152 ÷ √(*n* − 2) was estimated to be approximately 0.3 (in the present formula, the "CV" is the number of extractable factors and "*n*" is the sample size of the study).[24] According to the three-indicator rule, at least three items must exist for each factor.[25] Through the next step, the extracted factors were evaluated by confirmatory factor analysis (CFA) and goodness of fit indexes: the acceptable level of Parsimonious Normed Fit Index (PNFI), Parsimonious Comparative Fit Index (PCFI) and Adjusted Goodness of Fit Index (AGFI) was >0.5; that of Comparative of Fit Index (CFI) and Incremental Fit Index (IFI) was >0.9; that of Root Mean Square Error of Approximation (RMSEA) was >0.08; and for Minimum Discrepancy Function divided by Degrees of Freedom (CMIN/DF) <3 was considered good.[26]

Finally, in the second-order CFA, it is assumed that the extracted factors in the first stage are the reflections of another level of conception by their own and can show a more general concept on secondary and higher levels.[27] Therefore, after performing first-order CFA, a second-order CFA was implemented.

2.5 | Convergent and divergent validity

Convergent and divergent validity of the scale were evaluated using the average variance extracted (AVE), maximum shared squared variance (MSV) and average shared square variance (ASV).[28] For the existence of convergent validity, the AVE must be more than 0·5 and for confirming the divergent validity, MSV and ASV should be less than AVE.[29,30]

2.5.1 | Reliability

In order to assess the internal consistency of EOLCAS, average inter-item correlation (AIC), Cronbach's alpha and McDonald's omega were estimated.[31] The internal consistency of the scale was considered to be

appropriate if it was greater than 0.7.[32] Finally, the construct reliability (CR) was calculated.[25] CR was considered as an alternative to Cronbach's alpha coefficient in the analysis of the structural equation model. In the present study, CR greater than 0.7 was considered to be acceptable.[33]

2.5.2 | Normal distribution, outliers, and missing data

The univariate and multivariate distribution of data was investigated for the distribution of normal data individually by skewness (±3) and kurtosis (±7). The existence of multivariate outlier was assessed by Mahalanobis d-squared ($P < .001$) and multivariate normality by Mardia coefficient of multivariate kurtosis (>8).[33] The missing data were evaluated using multiple imputation, then replaced by the average participant response.[34] All statistical values were calculated by SPSS-AMOS$_{25}$ and JASP$_{0.9.0.1}$.

2.6 | Ethical approval

This study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (Code: IR.MAZUMS.REC.1397.3282), Sari, Iran. Nurses were informed about the study objectives and procedures. Moreover, they were assured that participation was voluntary. In addition, written informed consent was obtained from each participant. All participants were assured that the study finding would be reported and published anonymously.

3 | RESULTS

3.1 | Phase I

3.1.1 | Face and content validity

Regarding face validity, the results showed all items of the scale are appropriate, clear and straightforward to use. The results of CVI demonstrated that all items gained an index higher than 0·79 and were identified as appropriate without any need to be re-reviewed in the final version. Item no. 16 "*I want to deny my role as a caregiver*" was evaluated as an unacceptable item because of CVI =0·60. Also regarding the CVR results of the scale, CVR of all items was greater than the minimum value of 0·49 (according to the evaluation of the 15 specialists) in the Lawshe table.

3.2 | Phase II

3.2.1 | Survey development and construct validity and reliability

Based on the inclusion criteria, 60 nurses were excluded [clinical depression ($n = 51$), addiction ($n = 9$)]. Subsequently, 310 nurses met the criteria for inclusion in the study with response rate of 91·17%. The average age of the participants was 32·35 (SD = 5·51) years. The majority of participants were women (84·5%) with a bachelor in nursing degree (87·4%) and married (63·8%). The results of MLEFA are presented in Table 1. The KMO was 0·913 and Bartlett's test was 3106·58, $P < .0001$. Parallel analysis indicated four factors based on the random explained common variance, including *negative physical-emotional and social consequences*, *transcendental communication*, *information deficits and future rumination* (indicated in Table 1) with eigenvalues of 6·95, 3·32, 2·95 and 2·84 respectively, and this explained 83·924% of the total common variance.

Next, the factor structure obtained with MLEFA was assessed and validated using maximum likelihood CFA. According to the results, the goodness of fit indexes of the model confirmed the appropriateness of the first-order CFA model [χ^2 (111) = 225·85, $P < .0001$, AGFI = 0·885, PCFI = 0·786, PNFI = 0·759, IFI = 0·963, CFI = 0·963, RMSEA (90 % CI) = 0·058 (0·047 to 0·069)]. According to the final model of factor structure, the EOLCAS, measurement error of items four and five (e4 and e5) and 14 and 13 (e11 and e9) were correlated.

After reviewing the first CFA model, in order to evaluate, whether constructs, placing in the main concept of EOLCAS, secondary factor analysis was done. Figure 1 shows the second-order CFA. The significant factor loadings were greater than 0·3 for all items ($P < .0001$). CFA was conducted to confirm and validate the factor structure obtained from EFA. The results showed that the initial four-factor measurement model was a good fit, as evidenced by goodness of fit indices [χ^2(112) = 218·23, $P < .0001$, AGFI = 0.893, PCFI = 0.795, PNFI = 0.767, IFI = 0.966, CFI = 0.965, RMSEA (90% CI) = 0.055 (0.045-0.068)] and significant factor loadings greater than 0.5.

According to the findings, factor AVE (0.637, 0.457, 0.619 and 0.615 respectively) was greater than MSV (0.460, 0.457, 0.460 and 0.615 respectively) and ASV (0.335, 0.168, 0.301 and 0.171 respectively). Therefore, the considered structure has appropriate convergent and divergent validity. In addition, internal consistency (Table 1) and CR (0.932, 0.765, 0.862 and 0.750 respectively) of the EOLCAS in the four extracted factors in the present study was estimated to be desirable (>0.7).

4 | DISCUSSION

The results of the present study demonstrate that the EOLCAS includes four distinct and stable factors: *negative physical-emotional and social consequences*, *transcendental communication*, *information deficits* and *future rumination*. This explains 83.9% of the variance. Lee et al[15] extracted four factors with 53.47% variance (*Physical suffering*, *Burden*, *Maturation* and *Social support pursuit*) that was not similar to our study due to difference in factor names and number of items. It should be noted that the present study is the first to validate this tool in the Persian language.

Negative factors included *negative physical-emotional and social consequences*, *information deficits and future rumination*, which were negatively worded. As can be seen by the Cronbach alpha

TABLE 1 The results of performing EFA on the end-of-life caregiving experience appraisal scale

Factor's name	Q_n. item	Loading	h^2	Variance %	λ (95% CI)	Internal consistency
Physical-emotional and social adverse effects	1. *I feel fatigue while caring for the patient.*	0.961	0.740	38.77	6.95 (5.86-8.05)	α (95% CI) = 0.927 (0.914-0.939) AIC = 0.628 Ω = 0.934
	3. *I have experienced a role change* (e.g. *job)*	0.953	0.808			
	2. *I have sleep disturbance while caring for the patient.*	0.878	0.782			
	5. *I have limited social relationships* (e.g. *meeting friends)*	0.809	0.732			
	4. *I have limited time for myself while caring for the patient*	0.782	0.632			
	6. *I feel my health has gotten worse while caring for the patient.*	0.754	0.629			
	8. *I have indigestion while caring for the patient.*	0.720	0.673			
	7. *I have a financial burden* (e.g. *decreased household income) while caring for the patient.*	0.456	0.278			
Transcendental communication	13. *I feel good that I can do something for the patient.*	0.774	0.500	18.44	3.32 (2.79-3.84)	α (95% CI) = 0.776 (0·732-0.814) AIC = 0.465 Ω = 0.780
	12. *I have a better relationship with the patient while caring for him/her*	0.758	0.628			
	14. *I have a better relationship with other family members while caring for the patient.*	0.661	0.441			
	11. *I appreciate my formal and informal support networks* (e.g. *religion, friends).*	0.499	0.409			
Information deficit	30. *I want information regarding the patient's health status and how to care for the patient.*	0.963	0.802	16.38	2.95 (2.48-3.41)	α (95% CI) = 0.828 (0·792-0.858) AIC = 0.6161 Ω = 0.830
	29. *I need useful resources* (e.g. *volunteers) while caring for the patient*	0.661	0.530			
	31. *I need help regarding preparation for death and funeral services.*	0.634	0.586			
Future rumination	19. *I feel grief/loss about losing my patient.*	0.931	0.796	15.77	2.84 (2.39-3.28)	α (95% CI) = 0.683 (0.617-0.740) AIC = 0.433 Ω = 0.716
	20. *I feel depressed while caring for the patient.*	0.517	0.497			
	18. *I worry about what will happen to my patient.*	0.450	0.262			

coefficients, the findings indicate that nurses are constantly subjected to various levels of physical and psychosocial stress caused by caring for dying patients. In addition, recalling the death of past patients and the fear of death in current patients makes psychological problems more likely among nurses.[35] *Transcendental communication* was considered a positive factor in this instrument. The results of the pinquart study showed that nurses have different responses to these patients based on their culture and values.[36] The feeling of kindness in dealing with these patients and the sense of responsibility in trying to improve the quality of patient's life are ideal behavioural qualities. The results of model fitting were evaluated for all appropriate indices and all factor loads were above 0·5, indicating the existence of minimum acceptable factor load. Therefore, according to the results of CFA, the observed indices were confirmed and all fitness indicators enjoyed a suitable standard level. To the best of knowledge of the authors, this was the first time CFA was used in this type of study.

According to the final model of the EOLCAS, a relationship exists between the measurement error of items 4 (I have limited time for myself while caring for the patient) and 5 (I have limited social relationships) and also between that of items 13 (I feel good that I can do something for the patient) and 14 (I have a better relationship with other family). When the items are not properly known or because of

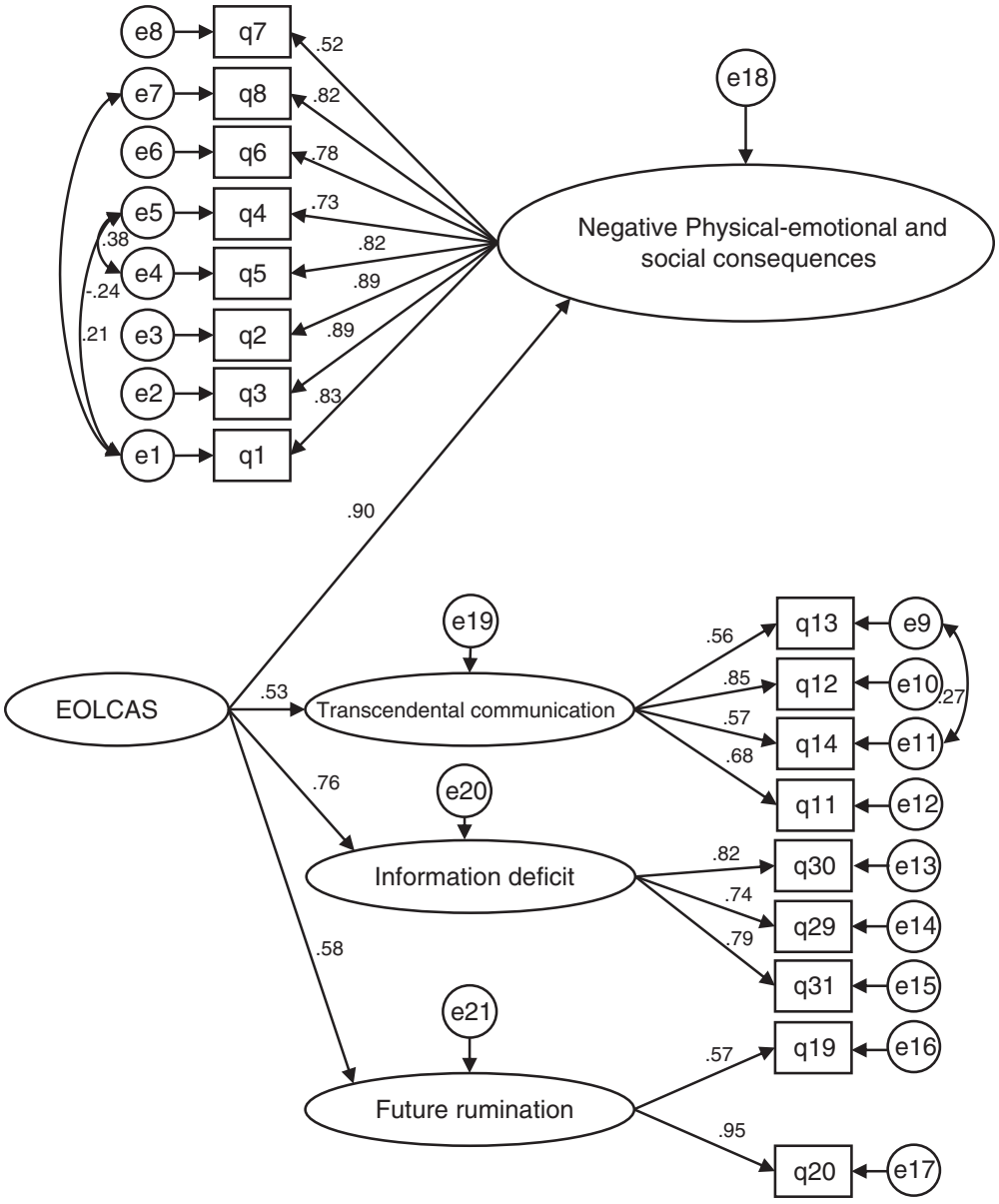

FIGURE 1 Final model of the second order CFA of the End-of-Life Caregiving Experience Appraisal Scale

the conceptual similarity of the sentences, measurement errors may occur. As the concept of these four terms indicate, items 4 and 5 contain a constricted concept and items 13 and 14 have a transcendental concept which can instil the same meaning in participants. To access a more accurate structural equation model, second-order CFA was used. The aim of this approach is to achieve a more meaningful method of data, assuming that the latent variables are caused by one or more factors of higher order in the common variance and the construct contains two levels.[27] In fact, first-level structures do not fully act as independent variables, and the correlation between them reflects the existence of a more general structure at the secondary conceptual level. The most appropriate approach for examining this structure is the structural equation model, because it can identify the first-level structures that have been distributed as latent variables.[37] The results of the present study showed that the items of the EOLCAS enjoy appropriate convergent and divergent validity in its final model. In his 1995 study, Hair states that convergent validity exists when the objects of the structure are close to each other and share a large variance together. On the other hand, divergent validity is stated to exist when the items of the considered structure or the latent extracted factors are completely separate from each other.[38] In the clearer sense, the appropriate convergent validity would not be possible if the latent factors are not well explained by the extracted clauses and are not sufficiently correlated.[28]

The internal consistency of the EOLCAS was acceptable by AIC, Cronbach's alpha and McDonald's omega. The high level of Cronbach's alpha signifies the internal consistency suitability of the scale and the correlation between the items.[39] In the study by Lee it has been stated that the total Cronbach's alpha coefficient is 0.84.[15] The AIC of the items in the factors should range between 0.2 and 0.4, while values in the range 0.1 to 0.5 are acceptable. According to the finding, AIC of the factors were greater than 0.4; therefore the AIC of

the factors was acceptable. In the present study also, CR was at a high level. One of the important attributes of CR estimation over Cronbach's alpha is that it is not affected by the number of scale items and obtained structure and is dependent on the actual amount of factor load of each item on the latent variable.[40] The CR value of the questionnaire was calculated in this study for the first time.

4.1 | Limitations and suggestion

There were some limitations in the present study. The researchers of this study have ensured that the forward-backward translation method was performed at a high standard and the original author of the scale confirmed the accuracy of the translation. Notwithstanding this, there is always a potential difficulty in using a scale that was originally designed for a different population. Cultural differences and language nuances may not be translatable, and test users would be advised to be cognizant of this potential issue. Factor naming was implemented according to the researchers' choice. Personal attitude of nurses at taking care of these patients, can be influenced by culture and values.[36] The lack of similar studies in terms of the type of statistical population, led to difficulty with compartmentalizing of the study. Therefore, we recommend that more detailed studies should be conducted by other investigators to obtain dependable results. Future validation studies with samples from different populations and also longitudinal designs are suggested to verify the findings of this study. Also, as Iranian population reside all over the world, testing of the tool on Iranians in Europe, Asia, and the United States would be beneficial to determine its generalizability to all Iranian diaspora.

4.2 | Implications for practice

It is clear from this study the importance of understanding and contributing to self-care in professionals who are working directly with patients who are inevitably close to the end of their life. This scale, which is the first in the Persian language, makes a significant contribution that helps to recognize nurses and other medical professionals who may be experiencing trauma or difficulty related to dealing with EOL caring. Ensuring direct and vicarious trauma is acknowledged and appropriate treatment is vital for ensuring a healthy nursing profession especially with regards to EOL care.

5 | CONCLUSION

The results of this study demonstrate that the EOLCAS enjoys sufficient validity and reliability. A significant percentage of the variance can be explained based on Iran's cultural context. Considering the importance of a comprehensive approach to patients in health care centres, the existence of such a tool can help to accurately measure nurses' experience in end-stage patient care thereby improving the quality of care delivered and the quality of patient's life.

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