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Design and Development of a Self-Report Competence Scale for The Assessment of Prehospital Health Professionals' Competence in Response to Radiological Events

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Original Research

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Abstract

Objectives: The objective of this study was to develop a self-report scale for the assessment of the competence of pre-hospital health professionals in responding to radiological incidents.
Methods: Based on the findings of a systematic review analyzing the literature, the instrument followed the processes of item generation, expert opinion, language control, pilot study, and field testing.
Results: In the exploratory factor analysis, 48 items were excluded on the grounds of insufficient common variance (>0.40) and factor loading relationship (>0.50). The remaining 18 items (11 negative and 7 positive items) exhibited a Cronbach's alpha value of 0.913 and a range of 0.740 to 0.887 in the sub-factors. As the scores on the developed scale increased, there was a corresponding increase in the perceived adequacy of the interventions.
Conclusions: The objective, scope, constraints and stages of the scale's design and development were elucidated in comprehensive detail, and its intelligibility to other societies was ensured. The scale was developed as a self-report scale that can evaluate the competence of prehospital health professionals in radiological incidents.

The term "radiological event" is defined as any occurrence involving exposure to a radioactive source or release.[1] A review of historical records reveals numerous instances of significant public health crises directly or indirectly related to radiological events. Such events include the Chernobyl Nuclear Power Plant disaster in 1986[2] and the Fukushima Nuclear Power Plant disaster in 2011,[3] which were caused by a natural disaster. A recent study[4] has revealed that a release of radioactive material occurred as a consequence of the Russian assault on the Zaporizhzhia Nuclear Power Plant during the Russia-Ukraine conflict of 2022. Nevertheless, a study on terrorist attack weapons indicates that only 12 of the approximately 700 000 terrorist incidents that occurred between 1970 and 2019 were of radiological origin.[5] This study suggests that, although radiological incidents have occurred infrequently, current geopolitical tensions and the proliferation of nuclear weapons have heightened concerns about the potential for targeted attacks to resume.

It is anticipated that those working in the field of health care will be able to provide an effective intervention in the event of a disaster or emergency. It is crucial for health care professionals to possess the capacity to manage extraordinary events and to demonstrate a range of intervention competencies, in addition to maintaining routine medical care, in such circumstances. For instance, health care professionals responding to an incident should possess competencies such as the ability to identify exposure and contamination, the capacity to manage scarce resources, the capability to apply crisis care standards, the skill to maintain workforce performance, the aptitude to understand the victim's needs, the ability to stabilise the victim, the proficiency to perform decontamination, and the knowledge to take medical precautions against the hazard [6]. Furthermore, they should be able to engage in coordinated cooperation with various health care professionals for effective intervention. Furthermore, it is the responsibility of the first responders to secure the scene, disinfect the victims and provide life-saving care.[7] However, it is notable that many health professionals have not received training on radiation. A paucity of knowledge may

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result in health professionals exhibiting limited intervention skills or competence, as well as an inclination towards fear and panic in the event of radiological incidents, as postulated by Dallas et al[8]. This has the potential to negatively impact the medical intervention and recovery efforts of health care professionals in the context of a radiological event [9]. Nevertheless, some studies indicate that health care professionals are less inclined to report for duty during a radiological incident than during other types of natural and man-made disasters[8]. The willingness of health care professionals to work during a radiological event is influenced by a number of factors, including self-efficacy, the perceived effectiveness of intervention, the perceived responsibility for the situation, the perceived safety of the event, the preparedness of their families, the training they have received in radiological disasters, and their knowledge of radiological disaster preparedness.[7] In a study, it is asserted that there are 7 limiting factors that affect the ability of health professionals to intervene in radiological incidents. These factors include the rarity of the event, inadequacy in the context of a radiological event (inadequacy of hospital, equipment, personnel, training and organization), sensory reactions, dilemma and ethical concern, communication, and workforce and other factors. This study underscores that the factor most influencing the actions of health care professionals in the event of a radiological incident is the perceived inadequacy in response to such an event.[6] In order to ascertain the factors affecting the intervention of health professionals in the event of a radiological incident, it is essential to determine the level of competence of these professionals in terms of their ability to respond effectively to such an event. The ability of health professionals to intervene effectively during a radiological incident is of paramount importance for the health and well-being of both themselves and the victims, as well as the relatives of the health professionals in question. The objective of this study was to develop a self-report scale for evaluating the response competence of pre-hospital health professionals in the context of radiological incidents.

Methods

Conceptual Validity

The scale of intervention competence of health professionals in radiological incidents was derived from a systematic review conducted by Dağ et al. to explore the various themes that influence the intervention of prehospital health professionals in radiological incidents. In their study, Dağ et al.[6] identified the factors influencing the response of prehospital health professionals to radiological incidents. Additionally, while the study highlights shortcomings in the provision of prehospital ambulance and emergency services, it also emphasises the competencies that health professionals should possess to effectively respond to such incidents. The factors affecting the response were categorised under 6 themes:

- Factor 1: Workload and lack of communication
- Factor 2: Lack of organization
- Factor 3: Ethical concerns and dilemma
- Factor 4: Emotional reactions (anxiety, fear, stress, and panic)
- Factor 5: Inadequate equipment, hospital and personnel
- Factor 6: Lack of education (knowledge, skills, experience)

Scale Development

In this methodological epidemiological study, a systematic and structured development process was followed based on a conceptual model proposed by Dağ et al.[6]

Substance production

The researchers were able to utilise the findings of the article entitled "Factors Affecting the Intervention of Health Care Professionals in Radiological Events: A Systematic Review" during the development of the Scale of Intervention Competence of Prehospital Health Professionals in Radiological Incidents. This study resulted in the creation of items that align with the existing literature on the specified themes within the conceptual framework.

Expert counseling

A total of 6 experts in the fields of emergency medicine, disaster medicine, public health, and disaster management were consulted for the purpose of evaluating the validity of the draft Prehospital Health Professionals' Intervention Competence Scale in Radiological Events, which had been prepared by the researchers. A questionnaire was devised to ascertain the experts' opinions regarding the scale. The draft scale and questionnaire, prepared by the researchers, were transmitted to the experts via email. According to the experts' feedback, the final draft of 66 items was derived from the original 70-item scale through the implementation of corrections to the Intervention Competence Scale of Prehospital Health Professionals in Radiological Incidents. A comprehensive account of the related decision-making process is presented in the subsequent analysis section.

Language control

Prior to the pilot study of the draft items, a linguist evaluated and refined the items to ensure adherence to established meaning and grammatical conventions. In the pilot study, feedback was obtained from participants regarding the questionnaire's design, clarity, and content.

Draft questionnaire

The draft version of the radiological events scale comprised 66 items. The items were responded to on a 5-point Likert scale, with responses ranging from "completely disagree" to "completely agree."

Field test

The study was conducted with the approval of the Health Sciences University Hamidiye Scientific Research Ethics Committee. The participants were health professionals working in the Istanbul Provincial Health Directorate Command Control Centre and 112 Ambulance Stations. The literature indicates that the developed scale should be tested in the field with a minimum of 10 participants[10] or a minimum of 5 participants[11] for each item on the scale. Given that the draft scale comprises 66 items, it is proposed that data saturation be reached with a minimum of 330 participants (66*5 = 330) and a maximum of 660 participants (66*10 = 660). Accordingly, 410 participants were selected through quota sampling, a non-probability sampling method. To conduct a test-retest analysis,[12] the same questionnaire was administered to 76 individuals (18.53%) who consented to the second questionnaire application 2-3 weeks later under identical conditions. The data were collected by a researcher through observation using the questionnaires distributed to the participants.

Analysis

The statistical analyses were conducted using the SPSS 19.0 statistical software package (IBM; Armonk, New York, USA). The results of the analyses are presented in 3 sections.

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Validity analyses were conducted. In order to ascertain the validity of the draft items for the radiological events scale, a series of analyses were conducted, including Content Validity Ratios (CVR), Content Validity Index (CVI), normality tests and Exploratory Factor Analyses (EFA). In accordance with the recommendations put forth by the 6 experts, modifications were made to the items, and a CVR and CVI analysis was conducted using the Lawshe technique. In determining whether to retain the items in the draft questionnaire, a group of 6 experts applied the CVR criterion of ≥0.99 and the CVI criterion of >0.67, which were calculated separately for each dimension .[12–14] The 60 items with a CVR of 0.99 or above were retained in the pool. Nevertheless, it is incumbent upon the scale developers to accept or reject the expert opinions as the final decision.[15] Consequently, a decision was taken to retain 6 additional items in the pool and to present participants with a total of 66 draft items. As the skewness and kurtosis values of each item fell within the range of ±1.5, it was deemed appropriate to conclude that the items were normally distributed.[16]

Given that the study comprises a number of disparate components, an EFA was conducted to elucidate the underlying structures of the variables whose structure remains partially unknown, yet whose existence is evident.[17] In order to obtain optimal results, factor loading values exceeding 0.500 were employed. In order to prevent the factor loadings of 2 items from being overlapping, a minimum difference of 0.15 was required.[17] A principal component analysis was employed to elucidate the underlying factors pertaining to disasters. In order to ascertain the number of factors that emerged at the conclusion of the analysis, eigenvalues of 1 and above were considered.[17] A communality value exceeding 0.400, which indicates the proportion of variance shared by a variable with other variables in the analysis, was selected.[17] Items with factor loading values below the specified threshold were excluded from the analysis and the process was repeated. In the initial EFA, 1 item (M62) was identified as having a communality value below the predetermined threshold. In the second, third, and fourth analyses, the factor loading values (I27, I10, I33 and I17, respectively) were inadequate and were therefore removed. Given that the items pertaining to radiology were transitive under disparate conceptual or thematic categories, oblique rotation was deemed the optimal approach. The suitability of the sample for factor analysis was evaluated based on the following criteria: a Kaiser-Meyer-Olkin (KMO) value exceeding 0.5, a P value less than 0.05 for the Barlett test, and an Anti-Image Correlation Matrix value exceeding 0.5.[17]

Reliability analyses were conducted. Test Re-test ($P < 0.05$), Interaclass Correlation Coefficient ($P < 0.05$), Item Analysis, Cronbach's Alpha, Split Half Reliability (Spearman-Brown), Additive (Tukey's Additivity Test) ($P < 0.05$), Response Bias (Hotelling's T-squared) ($P < 0.05$), and Floor and Ceiling Effect (<20%) tests were used in the reliability analyses of the scale.[12,17-19] Pearson correlation coefficient ≥0.25,[11] Cronbach's Alpha value >0.70, and corrected item total correlation coefficient >0.30 were taken in item analysis.[17]

Scoring. A Likert-type scale was constructed for the purpose of scoring the scale. The scale score of each respondent participating in the study is calculated as the sum of the response scores given to the items. Accordingly, the scoring of each respondent's answers to the items varies depending on whether the item is positive or negative. Inverse scoring is applied to negative items, with high scale scores indicating a positive attitude. In a Likert-type scale, 3 points in each item indicate indecision, with 1 point representing the negative end of the attitude spectrum and 5 points representing the positive end. The point values assigned to favorable and unfavorable scale items are inversely related.[20] In the study, positive statements were assigned a value of 1 for "Totally Disagree," 2 for "Disagree," 3 for "Neutral," 4 for "Agree," and 5 for "Totally Agree." The scoring for negative statements was as follows: "Totally Disagree" = 5 points, "Disagree" = 4 points, "Neutral" = 3 points, "Agree" = 2 points, and "Totally Agree" = 1 point. Consequently, 11 items out of 18 items were coded as reverse items, as indicated by an asterisk in Table 1.

Results

The statistical process related to the self-report scale used to evaluate the competence of prehospital health professionals in responding to radiological incidents is outlined in 4 steps below.

Field Findings

Among the study participants, 61.0% ($n = 250$) were female, 49.8% ($n = 204$) had completed an undergraduate or graduate education, and the mean age (SD) was 29.58 (6.02), with a median age of 27.0. The youngest participant was 22 years old, and the oldest was 52 years old. The majority of participants (73.7%, $n = 302$) rated their health as good. Additionally, 40.2% ($n = 165$) were married and 26.3% ($n = 108$) had at least 1 child. A total of 36.6% ($n = 150$) of the participants resided alone at their place of residence, while 22.0% ($n = 90$) perceived their income to be inadequate. The participants were predominantly emergency medical technicians (44.1%), followed by paramedics (40.2%) and doctors (15.6%). Additionally, 30.5% of the participants had received radiology education, with the dates of education spanning from 2005-2023.

Validity Findings

The normality test was employed to analyse the skewness and kurtosis values of each item in the data set. As the skewness and kurtosis values of the items fell within the ±1.5 range, they were deemed to be normally distributed.

A Pearson Product-Moment Correlation Coefficient calculation was performed to ascertain whether a relationship existed between the initial and subsequent responses of the participants ($n = 76$) to all scale statements. The test-retest was found to be statistically significant ($r = 0.57$, $P < 0.01$). In a further analysis conducted for the same purpose, an interclass correlation coefficient was calculated, and the Cronbach alpha value was found to be high and significantly correlated (Cronbach alpha = 0.932, $P < 0.001$). Nevertheless, 42 items (1-6, 8, 11, 12, 25, 26, 31, 34-61, 63-65) were excluded on the grounds that the item and total score correlation coefficients of the 66 items included in the draft exceeded 0.25 in the item analyses. The remaining 24 items were found to demonstrate a positive and statistically significant correlation, with coefficients ranging from $r = 0.339$-$r = 0.716$ ($P < 0.001$). Given that the item and total correlation coefficients exceeded the threshold of 0.25 and were statistically significant, EFA analyses were initiated.

In the EFA of the draft items, a KMO value exceeding 0.6 was deemed sufficient, and the Barlett's test yielded a significant result ($P < 0.01$). As previously stated, the communality of the items was less than 0.400, the loading values of the factors were less than 0.500, and there were overlapping values of less than 0.15. Consequently, the analyses were repeated on 4 occasions with the aim of increasing the total explained variance (items with a high number of insignificant correlations with other items in the correlation matrix table were removed). Five items were removed as a result. The final analysis yielded a 4-factor structure with an eigenvalue >1, as evidenced by

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Table 1. Items, factors, and item factor loadings

No	Factor	Items	Factor loadings 1	2	3	4	Eigenvalues	% of Variance	Cumalative %
22	Lack of workload, organization and communication	*The high workload in a mass radiological event would cause me to burn out	0.840				7.44	41.32	41.32
19		*Causes such as lack of sleep, hunger or fatigue adversely affect my capacity to respond to a radiation incident	0.785						
32		*Sudden radiation-induced patient fluctuation in the emergency department tires me	0.711						
23		I consult specialists in radiation protection	0.706						
21		I know the importance of coordination in the golden hours of a radiological event	0.684						
20		I ensure that contaminated patients have access to appropriate treatment	0.580						
18		I can coordinate patient flow in a radiological event	0.536						
24		*I hesitate to take a contaminated patient in the ambulance	0.520						
13	Ethical concerns and dilemma	*I reluctant to refer a patient with a high level of contamination		0.853			1.44	8.00	49.32
14		*I experience anxiety about intervening in a contaminated patient		0.841					
16		*I postpone the treatment of over-contaminated patients who threaten my health		0.620					
15		*I am frightened by the delayed onset of symptoms after radiation exposure		0.618					
7	Emotional reactions	*I am worried I can't feel the radiation with my senses			0.878		1.23	6.83	56.15
9		*I am afraid of the health effects of radiation			0.782				
66	Inadequate equipment, hospitals, personnel and training	* Worry about radiation exposure causes me stress				0.719	1.08	6.00	62.15
29		I know the hospitals that will be suitable for transport according to the level of patient contamination				0.648			
30		I can choose the appropriate hospital in the referral process of contaminated patients				0.628			
28		I have sufficient knowledge about radiation				0.534			

*Was coded as reverse item.

the rotated components table (Table 1) and the total explained variance. The 4 factors collectively account for 62.15% of the total variance. The first factor accounts for 41.32% of the total variance of the scale, the second factor explains 8.00%, the third factor explains 6.83%, and the fourth factor explains 1.08%. Following the validity analyses, 48 items were excluded from the 66 items, and reliability analyses were conducted.

Reliability Findings

The Spearman-Brown test, which is employed to ascertain the dependability of a scale in written tests with a view to circumventing some of the shortcomings associated with administering the same test to the same group on 2 occasions, yielded a score of 0.890. This test was conducted on the initial 66 items with a view to determining the reliability of the responses provided to the statements prior to embarking upon EFA analyses. However, it is presented here under the heading of reliability.

The homogeneity of the participants' responses to the draft items was assessed using Hotelling's T^2 test. The resulting Hotelling's T-square value was $T^2 = 599.898$, with a P value less than 0.001, indicating that there was no response bias. The floor and ceiling effect value percentages of the draft items were found to be below 20% in all dimensions. Furthermore, it was determined that the responses to the items exhibited a homogenous distribution.

The Cronbach's Alpha value of the draft items is notably high, at 0.913. The Cronbach's Alpha value for the first factor is 0.887, for the second factor is 0.805, for the third factor is 0.730, and for the fourth factor is 0.740. The corrected correlations of the items were found to be greater than 0.20. Following the EFA analyses, it was

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Table 2. Reliability values of the draft items

Dimensions	Number of items	Item total correlation	Item mean (SD)	Skewness/ Kurtosis	Cronbach Alpha
All substances	18	0.334–0.710	3.20(0.69)	–0.490/0.465	0.913
Lack of workload, organization and communication	8	0.531–0.724	3.47(0.85)	–0.412/0.075	0.887
Ethical concerns and dilemma	4	0.556–690	3.47(0.89)	–0.629/0.440	0.805
Emotional reactions	2	0.574	2.88(1.13)	–0.045/–0.832	0.730
Inadequate equipment, hospitals, personnel and training	4	0.351–0.666	3.50(0.78)	–0.545/0.418	0.740

decided to retain the remaining 18 items (Table 2). The results of the Tukey summability test indicated that the items of the scale were summable ($P < 0.001$).

Discussion

A paucity of studies exists in the literature on the factors that have a deleterious effect on the response of health professionals to radiological incidents in the field of pre-hospital emergency health services.[6-8] This is due to the infrequent occurrence of radioactive materials in the environment and the absence of any use of nuclear weapons in warfare for over 70 years, despite the recent incident at Fukushima. There has been a gradual decline in the training and interest of medical personnel in treating casualties from nuclear and radiological incidents in civilian institutions.[8] Furthermore, it could be argued that this is due to the lack of coverage of radiological issues within the training provided by official institutions for radiological incidents. To illustrate, in Türkiye, certification courses are offered to health professionals working in the pre-hospital field, including those specialising in basic life support, advanced life support, paediatric advanced life support, trauma and resuscitation, and ambulance driving techniques.[21] Consequently, only 2 studies on this subject have been identified in the literature. These studies report that health care professionals who intervened in the incident were trained in a number of key areas, including determining exposure and contamination, managing scarce resources, applying crisis care standards, maintaining workforce performance, understanding the victim's needs, stabilizing the victim, and so forth. Furthermore, it is imperative that teams possess the requisite competencies, including the ability to take medical precautions against potential hazards and to engage in collaborative efforts with diverse health care professionals to ensure effective intervention, maintain scene safety, disinfect victims, and provide vital information to facilitate the delivery of lifesaving care.[6,7] Nevertheless, a comprehensive evaluation of the competence required of health workers in the context of radiological incidents is currently lacking in the existing literature. To date, only Shubayr (2024) has conducted a questionnaire study for emergency nurses in the categories of radiation protection measures, radiation exposure effects, and decontamination procedures.[22] However, as stated in the methodology, there is a need for a tool that can holistically measure different aspects of the response of prehospital health professionals to radiological incidents. The fulfilment of this requirement in the existing literature will facilitate enhancements in the intervention perspectives of health professionals in radiological events. Consequently, private and public institutions and/or organizations operating in the pre-hospital field will increase their demand for tools that measure pre-incident intervention competence for radiological events, with a view toward preparing health professionals. This measurement tool is designed to assess the intervention competence of a specific group of health professionals in the context of radiological incidents. However, it should be noted that the scale has a technical focus, as it is related to a specific target group. Furthermore, as the scale of intervention competence of health professionals in radiological incidents is derived from publications delineated in the literature, it seeks to expedite the treatment processes of both health professionals themselves and their family members and individuals exposed to radiation. To illustrate, as evidenced in the study conducted by Dağ et al., the developed scale investigates and attempts to elucidate the factors influencing the intervention of pre-hospital health professionals in the context of radiological events.[6]

The objective was to contribute to the processes of preparation prior to the event and the ability to make appropriate and effective decisions during the event by determining the response competence of health care workers in the context of radiological incidents. In this regard, numerous experts with a background in public health, disaster medicine, emergency medicine and disaster science were consulted during the development of the measurement tool. Following this consultation, an analysis was conducted in accordance with the factors affecting the intervention of health professionals in radiological incidents as outlined by Dağ et al. (2023),[6] and in alignment with the objectives of the study.

The objective of this study was to ascertain the factors that impede the efficacy of health professionals in responding to radiological incidents. To this end, a scale was devised to assess the competence of health professionals in such incidents, and the scale was subjected to a validity and reliability analysis. In the scale development phase, the factors proposed by Dağ et al. (2023)[6] were adopted, and a pool of 70 items was created. In terms of content validity, 4 items were eliminated following the input of 6 experts. The remaining 66 items were then used for the application, after which data analysis was performed. The factor loadings of the scale items ranged from 0.520-0.878, resulting in the emergence of 4 factors comprising 18 items. In the exploratory factor analysis, the variables of workload and communication, inadequate organization and equipment, hospital and personnel, and inadequate training were grouped under the same factors. In scale development studies, various sources indicate that factor loading values should be at least 0.30,[23] 0.32,[16,24] and above 0.50.[25] Given that the lowest factor load in our study was 0.520, it can be concluded that the factor load of each item adequately measures the subject. Additionally, as no similar study was conducted during the scale's development, the scale was developed using a systematic method, as detailed in the methodology section.

In the analysis of scale reliability, the Cronbach alpha value is typically considered, and a value of 0.70 or above is generally required.[17,26,27] Both the sub-dimensions and the total Cronbach's alpha value of the scale measuring the competence of health professionals to intervene in radiological incidents were found to be above 0.70. Furthermore, the Hotelling's T-square value was found to be statistically significant ($P < 0.001$), as was the Tukey scale summability value. These results demonstrate that the variance between the groups is statistically significant, that the scale is summable, and that the measurement tool is therefore reliable.[28] Therefore, a valid and reliable 18-item scale of health professionals' competence to intervene in radiological incidents has been developed. It can be stated that the scale can be completed in a relatively short period of time due to the limited number of items.

The competence of health professionals in responding to radiological incidents is gauged by the scores they achieve on a scale of 18 items. A high score on the scale indicates that the health worker in question possesses the requisite competence to intervene in radiological incidents. In addition to the overall scoring system, the scores assigned to each factor can be analysed separately. Consequently, it is possible to ascertain which specific competence area the employees who demonstrate a lack of proficiency in responding to radiological incidents are lacking in. The development of various module training programs (covering workload and communication, organization, ethics, emotional control, equipment, hospital and personnel management, and radiation knowledge) in line with the general and sub-dimensions of the scale can enhance the preparedness of health professionals for the challenges they may face during radiological incidents. This approach can facilitate the protection of health professionals and their surroundings, while also ensuring the prompt and effective treatment of individuals in need of assistance.

Limitation

This study has the distinction of being the first of its kind to target pre-hospital health professionals. The 18 items are both comprehensible and concise, rendering them suitable for use by health professionals. Furthermore, the undertaking of post-implementation studies to assess the practical impact of the utilisation of the intervention competence scale in radiological incidents by health care professionals may assist in the comprehension of the alterations in attitudes and behaviours pertaining to radiological incidents. The most significant limitation of the study is the absence of a confirmatory factor analysis. It was assumed that the participants accurately reflected their self-reports in the questionnaire. Furthermore, there is no standardized test to which the developed questionnaire can be compared.

Conclusion

This study outlines the methodology employed in the design and development of a scale intended to assess response competence in radiological incidents, based on the self-report of health professionals. The methodology section provides a comprehensive account of the steps followed in the design and development process of the scale. Additionally, the section elucidates the purpose, scope, and limitations of the developed instrument in detail, with particular focus on its applicability to other populations. The scale development process yielded 18 core items addressing intervention competence in relation to workload, communication and organizational inadequacy (factor 1); ethical concerns and dilemmas (factor 2); emotional reactions (factor 3); and inadequacy of equipment, hospital, personnel, and training (factor 4). The scale of intervention competence of health professionals in radiological incidents comprises 11 negative and 7 positive items and is prepared with a 5-point Likert scale answering technique, ranging from "strongly agree" to "strongly disagree." As the scores under the scale and its sub-dimensions increase, it can be inferred that the intervention competence of the employee in response to the incident also increases.

The findings of the study demonstrated that the developed scale is a valid and reliable measurement tool for assessing the competence of prehospital health professionals in the intervention of radiological events. Nevertheless, it is believed that further development of the scale could be achieved by re-evaluating its validity and reliability with larger and more diverse samples. Furthermore, the creation of scale-specific training modules (covering workload and communication, organization, ethics, sensory control, equipment, hospital and personnel management, and radiation knowledge) will facilitate more effective preparation and intervention processes for health care professionals in the event of radiological incidents. Consequently, the deficiencies of health care professionals in radiological incidents can be identified with the developed scale, allowing for the creation of targeted training programs that address these gaps. To address these shortcomings, training workshops and simulation-based applied scenarios can be developed for the previously defined training modules. Such training is essential for health professionals to protect themselves, the patient they care for, and their environment. Consequently, this study evaluates the intervention competence of health professionals in the context of radiological events from the perspective of decision-makers. In response, an assessment tool has been developed for health managers and policymakers to reinforce the intervention framework of health professionals.

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