Research Paper

Designing a Professional Competence Model for Emergency Medical Technicians of the National Emergency Management Organization

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ABSTRACT

Background: Emergency medical services (EMSs) can be considered as the health system's main pillars. The competence of emergency medical technicians (EMTs) plays a vital role in reducing accident mortality rates. This research aims to design a professional competence model for the EMTs of the National Emergency Medical Organization (NEMO).

Materials and Methods: This is a mixed-method study. The main concepts for the model were first extracted through a literature review. Then, the opinions of 10 experts were used during three focus group discussion (FGD) sessions to localize and confirm the model. The opinions of 15 experts in accident and disaster risk management were used to measure the content validity of the model.

Results: The final model included five main themes (attribute, knowledge, skill, ability, and attitude), 11 sub-themes (physical health, mental health, professional knowledge, organizational knowledge, clinical skill, technical skill, managerial ability, cognitive ability, professional ability, individual attitude, and organizational attitude), and 47 categories. The results of the content validity test showed that the model and its items were acceptable and valid.

Conclusion: The designed model covered all domains required for the professional competence of EMTs and is a comprehensive and valid model tailored to national and international standards, which can be used as an adequate model in other countries.

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Introduction

Pre-hospital emergency medical services (EMS) are essential in reducing mortality [1]. The main goal of EMS is to save lives and reduce disability and death [2]. Emergency medical technicians (EMTs) arrive at the scene during accidents and disasters to immediately provide medical services. This shows the difficulty of their work. They perform a wide range of interventions such as airway management, injury assessment, advanced cardiopulmonary resuscitation (CPR), immobilization of patients, dressing wounds, intravenous therapy, and other advanced procedures [3]. The patients visited by EMTs are usually severely injured or are in bad health conditions and need to be stabilized and transported to the hospital quickly and safely [4]. The mortality rates depend on EMTs' prompt medical interventions. They have to make critical decisions quickly with little available data and unclear and complicated patient history [5]. Any tool that can help with proper clinical decision-making should be considered in this challenging situation. There are few standardized measures to help EMTs reliably predict the likelihood of patient hospitalization or death based on evidence-based practice. Effective management of resources and the enhancement of treatment outcomes is crucial in this profession [6]. Effective and timely intervention based on clinical information can significantly increase survival rates, especially for patients with heart and brain strokes [7-9].

Competence is a person's ability to appropriately manage critical situations and perform a task by applying knowledge and skills [10]. Professional competence refers to a set of knowledge, skills, and attitudes that enable employees to do their jobs according to the protocols [11]. One of the fundamental health needs is to train individuals with specialized scientific and practical abilities and qualifications to help injured people in critical situations [12]. EMTs need to be competent in making critical decisions using available equipment based on patient conditions and other complex aspects of pre-acute care [13]. Therefore, identifying and using the competence criteria in EMS training programs can help the EMTs improve overall patient care [14].

Despite the development of EMS training program. [15], comprehensive research has not been conducted in Iran on the professional competence of EMTs. In some studies on the challenges of EMS personnel in Iran, the lack of knowledge and skills has been reported [16-18]. In studies conducted in other countries, the dimension of knowledge and skills of EMS personnel, including the ability to perform clinical procedures, has been investigated [19, 20]. In the study by AlShammari et al. in 2019 on the professional competence of EMTs in Saudi Arabia, in addition to knowledge and skills, several dimensions, including familiarity with legal issues, critical thinking, creative thinking, the ability to communicate with patients and other colleagues, stress management, and professional ethics were investigated [21]. Moreover, in a study conducted in Taiwan in 2018 on the qualifications of EMTs, it was concluded that, in addition to knowledge and clinical skills, other skills, including personal growth, report writing, communication skills, critical thinking, and ethical and professional skills, are essential [22]. It is necessary to regularly assess the professional competence of EMS personnel to ensure they can effectively deliver emergency services. In this regard, this research aims to develop a professional competence model for the EMTs of the National Emergency Management Organization (NEMO).

Methods

This is a mixed-method study. The steps depicted in Figure 1 were taken to conduct the study. In the first step, after searching in databases such as PubMed, Google Scholar, and Scopus, using the keywords "competency," "technicians," "emergency," and "pre-hospital," the related articles were extracted and reviewed (Table 1). Then, qualitative content analysis was conducted to discover the hidden meanings and find concepts through systematic classification and coding [23, 24]. In the second stage, focus group discussion (FGD) sessions with the presence of 10 experts, including EMS officials and department heads, were held to localize the competence model for EMTs (CMEMT) in Iran. The characteristics of the experts are presented in Table 2. The FGD is a proper method for people involved in the decision-making process and provides them with information about the discussion. The discussion was guided by a trained interviewer (who was the discussion facilitator) [25]. Three rounds of FGDs for five hours and 30 minutes were held from June to July 2023. The experts spent the first 30 minutes of each session on the researchers' presentation of the results, creating a common understanding of the concepts. This created a common mindset among the researchers and experts. The experts discussed and exchanged opinions on the main themes and sub-themes after the presentation. At the end of the third FGD session, the proposed model was presented, after validation by the experts.

Table 1. The concepts related to the EMT professional competence extracted from the reviewed articles

Components	Reference
Diagnosis, implementation, health/patient education, professional development, ethical practice, critical thinking and teamwork, research and development	[23]
Checking the scene safety, assessing the cause of injury, checking the adequacy of airway, breathing, and circulation; assessing the level of consciousness, identifying the life-threatening conditions, assessing head, spinal, chest, abdominal, neurological function, hypothermia, evidence of shock; immobilization of patients with fractures (extrication, use of traction splint, head immobilizer, spinal column), perform (CPR, ACLS, trauma care, automated external defibrillator), managing pain with non-narcotic/analgesic/narcotic analgesic drugs, administering medicines needed during CPR/ACLS/trauma care	[20]
Legal and ethical, safety procedures, non-discriminatory practice, decision making and critical thinking, providing appropriate and professional approach, taking patient history, appropriate scene management, communication, skills, appropriate patient interaction, professional development, maintaining an appropriate physical condition, managing personal emotions, different transportation modes, leadership skills, providing health and social advocacy, flexibility in learning, preparing for and managing disasters	[21]
Communication, numeracy, problem-solving, self-development, resource management, interpersonal, informational, technical, perception of organizational capabilities, professional ethics	[31]
Approach to giving care to sick patients, identifying symptoms and signs of illness, adjusting the paces for giving care to sick patients, using the patients' experience; documenting, evaluating, identifying infection and carrying out infection prevention measures; self-care, identifying patients with risky behaviors, ethical issues, assessing the patient's condition based on the ABCDE approach, carrying out investigations, identifying risky environments and creating a space for safe care, implementing evidence-based care, comfortable transportation, sharing knowledge of the EMS responsibilities	[29]
Ethical and legal, caring and empathy, consistent in fitness, non-discriminatory practice, stress management, confidentiality, maintaining personal health, adherence to ethics, embracing social responsibility, infection control practice, conducting ongoing assessments and providing care, trustworthy, driving ambulance, being part of a team, critical thinking, clinical reasoning	[22]
Core clinical knowledge (cardiovascular, pulmonary, gastrointestinal, renal and genitourinary, obstetrics and gynecology, pediatrics, toxicology, eyes, ears, nose, throat, oral, and neck), specific aspects of emergency medicine (disaster, abuse and assault, environmental injuries, pre-hospital care), clinical procedures and skills (e.g. CPR)	[32]
Behavioral characteristics, job characteristics, social skills, attitudes, positive attitude to education, specialized skills, problem-solving perspective, technical skills, knowledge and information, thinking ability, system attitude, managerial abilities, job skills	[28]
Educational competence (up-to-date student, fieldwork, transfer of the materials), ethical competence (role modeling, neat appearance, not distinguishing between students), classroom management (having a course, lesson planning)	[19]
Leadership, generic abilities, interpersonal communication, institutional collaboration, pedagogic skills, relevant knowledge, professional judgment, professional skills, research activities, and technical skills	[30]

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ACLS: Advanced cardiac life support; ABCDE: Airway, breathing, circulation, disability, exposure.

A researcher-made questionnaire containing the identified components was designed. The guidelines were sent to 20 experts, including university professors, managers of the incident management centers in medical universities, and EMT training officials. Of 20, 15 questionnaires were completed and returned. The experts were asked to classify each of the items based on the three-point Likert scale "necessary", "useful, but not necessary", and "not necessary". To measure the content validity ratio (CVR). To measure the content validity index (CVI), the experts were asked to rate the relevance (1=not relevant, 2=relatively relevant, 3=relevant, and 4=completely relevant), simplicity (1=complex, 2=somewhat complex, 3=simple, and 4=completely simple) and clarity (1=not clear, 2=relatively clear, 3=clear, and 4=completely clear) of each item.

The CVR was measured based on the Lawshe method [26] the following formula: CVR=(Ne-N/2)/(N/2), where Ne is the number of experts who answered the "necessary" option, and N is the total number of experts. The minimum acceptable CVR value for 15 experts is about 0.40. Waltz & Bausell's method was used to measure CVI [27] based on the following formula: CVI=number of experts providing a score of 3 or 4/total number of experts. The minimum acceptable value for the CVI index is 0.79.

Results

Table 3 shows the results of qualitative content analysis and classification of the results for proposing the initial CMEMT, which had five main themes and 18 sub-themes.

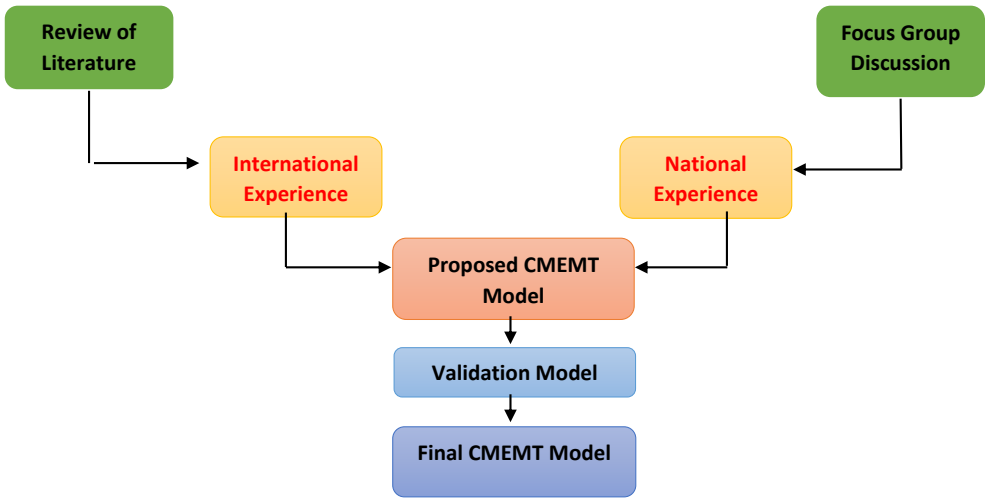

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Figure 1. The flowchart of the steps taken to conduct the research

Table 2. Demographic characteristics of the experts

Demographic Characteristics		No. (%)
Sex	Male	11(74.4)
	Female	4(25.6)
Age (y)	<30	0(0)
	30-40	6(40)
	41-50	8(53.4)
	>50	1(6.6)
Work experience	5-10	13(59.1)
	11-15	6(27.3)
	15-20	3(13.6)
Workplace	Lecturer in emergency medicine	2(13.4)
	EMT training officials	10(66.6)
	Emergency medical staff officials	3(20)
Educational level	Associate degree	0(0)
	Bachelor's degree	7(46.6)
	Master's degree	6(40)
	PhD	2(13.3)

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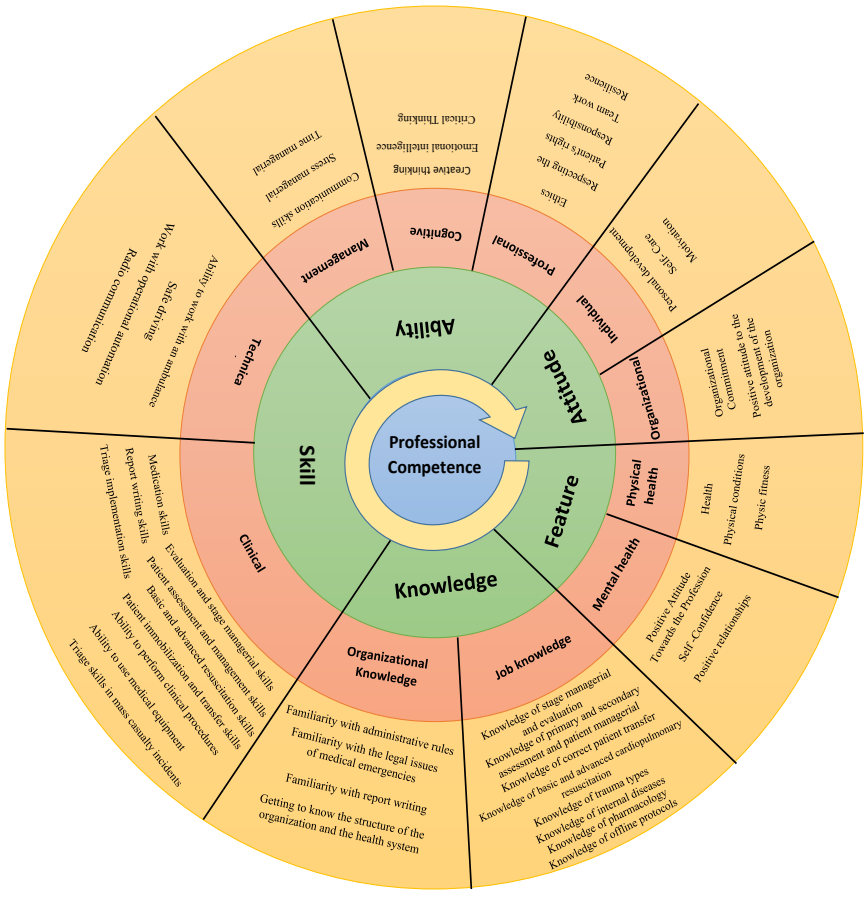

Figure 2. The final CMEMT

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During the FGD sessions, the number of themes remained unchanged, but the number of sub-themes decreased from 18 to 11. The final CMEMT included five main themes (attribute, knowledge, skill, ability, and attitude) and 11 sub-themes (physical health, mental health, professional knowledge, organizational knowledge, clinical skill, technical skill, managerial ability, cognitive ability, professional ability, individual attitude, and organizational attitude). Figure 2 illustrates the final CMEMT. Table 4 shows the values of the CVR and CVI for each item of the questionnaire designed based on the CMEMT. All items were confirmed, and no items were deleted.

Table 3. The initial CMEMT themes and sub-themes

Initial CMEMT				
Leadership	**Communication and Relationship Management**	**Job Skills and Knowledge**	**Awareness of the Health Care Environment**	**Being Professional**
Workforce	Promotion of interactions	Scientific and practical qualification	Performance of healthcare systems	Requirements based on professional expectations
Creativity	Occupational psychology	Teaching and learning	Pre-hospital care	Ability
Organizational progress Planning and management	Feedback from the patient	Knowledge Skill	Clinical competence	Quality of care Job performance

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Table 4. The domains and items of the CMEMT-based questionnaire and the CVR/CVI values

Themes	Sub-themes	Items	CVR	CVI
Attribute	Physical health	The technician is physically health.	1	0.93
		The technician is in good physical condition.	0.6	0.82
		The technician has proper physical fitness	1	0.93
	Mental health	The technician holds a positive opinion about the EMS	0.6	0.75
		The technician has good self-confidence.	0.86	0.88
		The technician establishes good relationships with others.	0.86	0.91
Knowledge	Professional knowledge	The technician knows how to evaluate and manage the scene.	1	0.93
		The technician knows how to evaluate and manage the patient	1	0.93
		The technician knows the correct method of patient transfer	1	0.97
		The technician has the necessary knowledge of basic and advanced CPR.	1	0.97
		The technician knows all types of internal diseases	1	0.95
		The technician knows all types of trauma	1	0.97
		The technician has knowledge of pharmacology (8 principles of drug administration).	1	0.95
		The technician knows offline protocols	1	0.97
	Organizational knowledge	The technician is familiar with administrative rules	1	0.86
		The technician is familiar with legal rules	1	0.88
		The technician is familiar with writing reports	1	0.95
		The technician is familiar with the structure of the organization and the health system.	1	0.86
Skill	Clinical	The technician has the necessary skills to evaluate and manage the scene.	1	0.97
		The technician has the necessary skills to evaluate and manage the patient.	1	0.97
		The technician has the necessary skills to perform basic and advanced CPR.	1	0.97
		The technician has the necessary skills to stabilize and transfer the patient	1	0.97
		The technician has the necessary skills to perform clinical procedures	1	0.91
		The technician has the necessary skills to use medical equipment	1	0.97
		The technician has the necessary skills to perform triage in accidents with mass casualties	1	0.97
		The technician has the necessary report-writing skills	1	1
		The technician has the necessary skills to administer medication (8 principles of medication administration).	1	0.93
	Technical	The technician has the necessary skills to drive an ambulance	1	0.97
		The technician has the necessary skills for safe driving	1	0.95
		The technician has the necessary skills to work with operations automation	0.86	1
		The technician has the necessary skills to install a radio	0.86	0.97

Themes	Sub-themes	Items	CVR	CVI
Ability	Managerial	The technician has good communication ability.	1	0.82
		The technician can control and manage stress.	1	0.77
		The technician can manage time during the mission.	1	0.82
	Cognitive	The technician has a creative thinking ability	0.6	0.68
		The technician has good emotional intelligence.	0.6	0.73
		The technician has a critical thinking ability.	0.6	0.64
	Professional	The technician can observe professional ethics.	1	0.75
		The technician respects the patient's rights.	0.86	0.84
		The technician is responsible for their actions and performance.	1	0.86
		The technician can work as part of a team.	1	0.91
		The technician has good resilience.	0.73	0.77
Attitude	Individual	The technician has a personal development attitude.	0.6	0.62
		The technician has a self-care attitude.	1	0.75
		The technician has enough motivation to work.	1	0.73
	Organization	The technician is committed to the organization.	0.73	0.82
		The technician has a positive attitude towards the development of the organization and its progress.	0.73	0.77

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Discussion

This research was conducted to design a professional competence model for the NEMO's EMTs based on national and international experiences. The final model, abbreviated as CMEMT, had five main themes and 11 sub-themes. The professional competence of EMTs included the five themes of attribute, knowledge, skills, ability, and attitude, and its sub-themes included physical health, mental health, professional knowledge, organizational knowledge, clinical skills, technical skills, managerial ability, cognitive ability, professional ability, individual attitude, and organizational attitude. In addition to introducing the essential components for the professional competence of EMTs, the designed model also included the characteristics and attitudes of EMTs.

Attribute was the first theme in the CMEMT. The health characteristics are the basis for the professional competence of EMTs. This theme included two sub-themes of physical and mental health. The physical health sub-theme included three categories of health, proper physical conditions, and physical fitness. The mental health sub-theme included positive thoughts about the EMS profession, self-confidence, and positive relationships with others. Physical and mental health have also been considered in the studies by Poorkarimi et al. [28], Chang et al. [22], and Nilsson et al. [29].

After acquiring the necessary characteristics, the next step is to acquire professional and organizational knowledge. Compliance with the principles, rules, and job requirements within an organization and when engaging in tasks can enhance the quality of EMS. Therefore, upon the arrival of new EMTs, they should familiarize themselves with the standards, principles, and expected performance. There were 12 categories in the knowledge theme, which have also been mentioned in other studies [23, 28, 30]. This theme included knowledge of patient evaluation and management, correct referral of patients, basic and advanced CPR, recognition of internal diseases, recognition of trauma, pharmacology, offline protocols, administrative rules, legal rules, report writing, organization structure, and health system.

In the CMEMT, skill was the next important theme, after knowledge. The EMTs need to have technical skills in addition to clinical skills. Clinical skills included nine categories of scene evaluation and management, patient evaluation and management, basic and advanced CPR, patient immobilization and transfer, clinical procedures, medical equipment use, triage in accidents with mass casualty, report writing, and medication. Technical skills included driving an ambulance, safe driving, working with operations automation, and establishing radio communications. Considering the advancement of technology and medical knowledge, sufficient knowledge and skill in this profession seem necessary.

In the ability theme, the factors affecting the professional competence of EMTs were divided into three subthemes: Managerial, cognitive, and professional. The managerial sub-theme included communication, stress management, and time management. In the studies by Poorkarimi et al. [28], Chang et al. [23], and Nilsson et al. [29], these abilities have also been mentioned. Time management is a critical factor for EMS personnel. Prioritizing time in emergency situations can help reduce mortality rates. On the other hand, since EMS personnel often face stressful conditions in their workplace, stress management ability is particularly important for them to maintain their physical health and work. Also, considering that they are constantly in contact with injured people, other relief groups, or colleagues, possessing communication ability is of utmost importance. The next sub-theme was cognitive ability, which had three categories: creative thinking, emotional intelligence, and critical thinking. In Al-Shmari et al.'s study [21], this factor was also mentioned and listed as one component of competence in EMTs. The professional sub-theme addresses issues such as respecting the patient's rights, adhering to professional ethics, demonstrating responsibility and resilience, and fostering teamwork. The studies on the EMS personnel have emphasized the need for improved coordination and teamwork among EMTs [29-32].

In the CMEMS model, attitude was the final theme, which had two sub-themes of individual and organizational. Individual attitude consisted of attitude towards personal growth, self-care, and sufficient work motivation. On the other hand, organizational attitude included a positive attitude towards the development and progress of the organization and having commitment to the organization, which can improve performance and increase the productivity of organizations.

Conclusion

The designed model for the professional competence of the NEMO's EMTs is a comprehensive and coherent model tailored to international and national standards and can be used in other countries. This model can help EMTs reach their highest qualifications.

Ethical Considerations

Compliance with ethical guidelines

All ethical considerations, such as a clear explanation of the study objectives to experts and obtaining their informed consent, their freedom to leave in the study, and confidentiality of their personal information, were observed. A code of ethics was obtained from Tabriz Branch, the Islamic Azad University (Code: IR.IAU.TABRIZ.REC.1401.218),

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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