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RESEARCH ARTICLE

The clinical skills of emergency medical staff confronting trauma

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ABSTRACT

Background: Today, the accidents and catastrophes causing trauma are one of the fundamental health needs of industrial world, and also a prevalent cause of mortality, especially in Iran. Thus, pre-hospital and emergency medical system care are considered one of the important factors in an effective trauma system. **Aims and Objectives:** The aim of this study was to evaluate the knowledge and clinical skills of emergency medical staff confronting trauma. **Materials and Methods:** In this cross-sectional study, based on the calculated sample size, 79 medical emergency technicians working in Alborz province-wide emergency centers were randomly selected. Data collected were included demographic information, "clinical skill checklist," including 9 skills and a written exam. Content validity of the "clinical skill checklist" has been evaluated and confirmed by 10 professors and specialists. Furthermore, reliability coefficient of all skills was equal to 0.82. The researcher observed the medical emergency personnel skills and then completed the "clinical skill checklist." Data were analyzed by SPSS Version 20, and statistical tests including independent *t*-tests and correlation coefficient of Pearson. **Results:** The results of the study indicated that knowledge of technicians in the field of trauma was poor in 5.1%, moderate in 91.1%, and fair in 3.8%. Furthermore, evaluation of trauma skills indicated that 51.9% had high skills and 48.1% moderate skills. Comparing the skill level with the ideal skill levels showed a significant gap in all sub-scales of skills (0.01). Pearson correlation test showed no significant association between knowledge and trauma skills. **Conclusion:** Due to the significant distance between scores of the present participants and the optimum level and also given the importance of the work of emergency staff as first responders, it is expected that higher quality education held for all emergency service providers can provide good and high-quality services to help-seekers.

KEY WORDS: Trauma; Emergency Medical Services; Accidents

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INTRODUCTION

Nowadays, trauma is considered a growing health problem Worldwide[1] and one of the major causes of morbidity and mortality in modern societies,[2] as more than 90% of mortality in developing countries result from accidents and different natural and man-made disasters.[3] At present,

trauma is the fourth leading cause of death in the world, but according to the World Health Organization estimates, there would be a 40% increase in death rates of trauma by 2030.[4] Iran is a developing country and one of the 10 most disaster-prone and vulnerable countries in the world and 90% of the population are exposed to the risks of earthquakes and huge floods.[3] Injuries in Iran are the most common cause of death among the age group under 50,[5] and road accidents are announced the second cause of death after cardiovascular events.[6] According to the available statistics, Iran with an annual mortality incidence of over 24,000 and about 0.8 million people injured as a result of trauma has the highest world's rates.[7-10] Many studies have shown that in low- and middle-income countries, the vast majority of death following traumatic events occurs in the pre-hospital settings.[11-13] Thus, providing proper care may reduce the mortality rate in traumatic patients.[12,14-18] In the process of pre-hospital trauma care, patient care at the scene, relocation, and transfer to proper centers are considered essential steps.[18,19] Inadequacy of pre-hospital trauma care is observed in many countries.[20-22] In Iran, 60% of deaths occur at the accident scene or during transporting the injured to the hospital, and 30% occur in hospital.[10,13,23] One of the major causes of unsatisfactory performance of pre-hospital emergency staff in providing trauma care is lack of knowledge and necessary skills.[24] In Iran, in addition to lack of professional staff, insufficient knowledge and skills of current employees are of the fundamental causes of the current unfavorable situation.[25] Hence, improving knowledge and skills of this segment of the health system will facilitate the provision of emergency care.[26] Since assessing the quality of staff's work at the scene is not practical, the simulation method, which is reliable and reproducible, seems desirable.[27] Therefore, the present study was conducted considering this issue and investigating the gap between the current and the ideal situation of emergency staff functioning, according to a standard checklist of "National registry of clinical skills of emergency medicine technicians."

MATERIALS AND METHODS

The present cross-sectional study investigated the emergency medicine students of Alborz University of Medical Sciences. The study population consisted of all bachelor students (n = 46), who were enrolled by consensus method. Study variables included professional experience, knowledge, and clinical skills of students in trauma. Data collection tool were included a written exam consisting of 50 questions, standardized by the specialists and professors of Department of Emergency Medicine, and the standardized clinical skills checklist, including skills in 9 field of pre-hospital trauma care. These skills include: (1) Assessing the traumatic patient (40 points), (2) restricting the spine movement of the sitting patient (11 points), (3) restricting the spine movement of the patient lying down (13 points), (4) restricting the movement of the patient's long bones (11 points), (5) restricting the movement of the patient's injured joint (9 points), (6) controlling bleeding and treating shock (11 points), (7) oropharyngeal and nasal-pharyngeal airway tube and suctioning (13 points), (8) ventilation and orotracheal intubation (19 points), and (9) cardiopulmonary resuscitation (CPR) (36 points), which were prepared according to the "National registry of clinical skills in emergency medical technician" and its reliability and validity were confirmed.[28] The performance of each skill scored one and its non-performance scored zero. This checklist was reviewed and approved by professors of emergency medicine. Clinical skills scores were as follows: Poor rating from zero to 54, average rating from 55 to 108; and good rating from 109 to 162. After the written exam, to assess the clinical skills, the objective structured clinical examination was used, and for each skill, one station was designed and prepared. Then, an expert observer recorded the scores based on observing the skills of students at each of the stations in accordance with the checklist. After collecting scores of each checklist, the data were entered into SPSS software version 20. Descriptive statistics, as well as, single-sample t-test were used to compare the clinical skill subscales with a fair level, and Pearson correlation test and ANOVA were used to investigate the association between knowledge and clinical skills of students with each other and between different groups.This study is in compliance with all principles of research ethics and after the approval of the University Research Committee has been obtained (ethic code: Abzums. Rec. 1394.34).

RESULTS

51.9% aged 20–30 years old, 43% of participants had more than 5 years of work experience, 73.4% had company relationship, 36.7% of subjects had over 15 h of in-service practical training, and 40.5% theoretical training in trauma. Of the total 79 employees under study, 91.1% (72 participants) had average level of clinical knowledge in the field of trauma. Mean scores of clinical skills were 25.25 with a standard deviation of 5.87 [Table 1], and functionally, 51.9% (41participants) had high level skills, and 48.1% (38 participants) had moderate level skills. Mean scores of clinical skills were 109.66 with a standard deviation of 16.33 [Table 2]. The results of the

Table 1: Distribution of frequency and percentages of participants according to the level of clinical knowledge in trauma

Variable	Category	Frequency (%)	Mean±SD
Clinical knowledge	Poor (0–16)	4 (5.1)	25.25±5.87
	Medium (17-33)	72 (91.1)	
	Fair (34-50)	3 (3.8)	
	Total	79 (100)	

The score of theoretic knowledge of traumatized patient ranged from 0 to 50. SD: Standard deviation

skills of participants in each subscale and comparison with the ideal level (maximum points) showed a significant gap in all subscales between the skills of the studied people with ideal skills. So that, the smallest gap of scores was related to the scale "restricting the movement of the injured joint" and "restricting the movement of injured long bones" and the largest skilled gap was related to the "assessing the traumatic patients" and "cardiac pulmonary resuscitation" [Table 3]. The results of this study also showed no significant association between theoretical knowledge and clinical skills; theoretical knowledge could not guarantee clinical skills of subjects [Table 4]. Finally, one-way ANOVA compared the scores of knowledge and skills of the study participants in different groups regarding professional experience, and hours of theoretic and practical training in trauma that showed that there was only a significant difference between groups with different professional experience and functional scores. The results of Scheffe *post hoc* test also showed a difference between the two groups with 2–5 years of experience and more than 5 years [Tables 5-7].

DISCUSSION

The findings of the present study showed that of 79 participants, 91.1% (72 participants) had average level of clinical knowledge regarding trauma. Mean scores of clinical knowledge were 25.25 with a standard deviation of 5.87. Hence, generally, it could be concluded that most of the study population had an average level of knowledge of taking care of traumatic patients. In addition, regarding clinical skills to deal with traumatic patients, 51.9% (41 participants) had a fair skill level, and 48.1% (38 participants) had a moderate skill level. A study in 2011 by Studnek and colleagues, entitled "The association between the scene of emergency medicine using stimulated stations and written exam" in the United States showed that of 197 participants, 86% passed the practical exam, and 72% passed the theoretic exam successfully.[27] Furthermore, the study results by Fallahi Khoshknab and colleagues, entitled "Assessing the clinical skills of emergency medical personnel in trauma emergency center in Tehran" showed that 62.4% of staff had fair level of skill in trauma.[29] Results of the study by Kumar and associates showed insufficient knowledge and skills among emergency medical personnel and the need for continuing education during their service.[30] Results of another study, entitled "evaluation of the resuscitation skills of children by Paramedics using mannequins" showed that participants were defective in many cases, including airway maintenance, ventilation, and proper use of tubes, calculation, and administration of drugs and fluids that should be considered by trainers of these groups.[31] The results of the skills of participants in each subscale and comparison with the ideal level (maximum points) showed a significant gap in all subscales between the skills of the studied people and the ideal skill. So that, the smallest gap of scores was related to the scale "restricting the movement of the injured joint" and "restricting the movement of injured long bones" and the largest skilled gap was related to the "assessing the traumatic patients" and "cardiac pulmonary resuscitation." However, Fallahi Khoshknab and colleagues reported the most defects in two skills "restricting the movement of the patient's spine" and "the use of traction splints."[29] Furthermore, the test results showed that the theoretical knowledge and clinical

Table 2: Distribution of frequency and percentages of participants according to the level of clinical skills in trauma

Variable	Category	Frequency (%)	Mean±SD
Clinical skills	Poor (0–55)	0 (0)	109.66±16.33
	Medium (55–108)	38 (48.1)	
	Fair (109–162)	41 (51.9)	
	Total	79 (100)	

The score of clinical skills regarding traumatized patient was a total of 9 skills ranging from 0 to 162. SD: Standard deviation

Table 3: The results of one-sample *t*-test of the scores of the theoretic exam and the clinical skills subscales in the participants regarding trauma

Variables	Mean±SD	Ideal score	Skill gap	t	*P*
Theoretic score	25.25±5.8	50	−24.75	−12.83	*P*<0.001
Assessing the traumatic patient	27.17±5.78	40	−12.83	−19.7	*P*<0.001
Controlling bleeding and treating shock	7.01±1.59	11	−3.99	−22.18	*P*<0.001
Restricting the spine movement of the patient lying down	7.44±2.37	13	−5.56	−20.76	*P*<0.001
Restricting the spine movement of the sitting patient	6.82±1.92	11	−4.18	−19.27	*P*<0.001
CPR	24.12±5.21	36	−11.88	−20.23	*P*<0.001
Restricting the movement of the patient's injured joint	6.25±1.38	9	−2.75	−17.66	*P*<0.001
Restricting the movement of the patient's long bones	7.67±1.97	11	−3.33	−14.95	*P*<0.001
Ventilation and orotracheal intubation	13.89±3.16	19	−5.11	−14.32	*P*<0.001
Oropharyngeal and nasal-pharyngeal airway tube and suctioning	9.25±1.91	13	−3.75	−17.42	*P*<0.001
Total score of clinical skills	109.65±16.33	162	−52.35	−28.47	*P*<0.001

Table 4: The association between knowledge and clinical skills in the participants in trauma

The level of clinical skills		
The level of clinical knowledge	r (correlation)	0.175
	Sig. (significance level)	0.123
	n (number)	79

Table 5: ANOVA for comparing the scores of knowledge in trauma in three groups of professional experience, and hours of theoretic and practical education in trauma

Variables	Mean±SD	F	*P*
Professional experience (years)			
<2	24.40±5.96	0.217	*P*=0.805
2–5	25.63±4.62		
>5	6.87±25.29		
Theoretic education in each group (hours)			
<10	24.25±6.06	0.840	*P*=0.436
10–15	25±7.36		
>15	25.25±3.92		
Practical education in each group (hours)			
<10	26.09±6.04	0.555	*P*=0.576
10–15	25.75±6.54		
>15	25.57±4.88		

Table 6: ANOVA for comparing the scores of skills in trauma in three groups of professional experience, and hours of theoretic and practical education in trauma

Variables	Mean±SD	F	*P*
Professional experience (years)			
<2	110.33±15.28	4.712	*P*=0.012*
2–5	103.13±14.32		
>5	115.11±16.79		
Theoretic education in each group (hours)			
<10	105.45±15.55	1.496	*P*=0.231
10–15	109.57±17.68		
>15	113.20±15.41		
Practical education in each group (hours)			
<10	109.09±12.84	0.1444	*P*=0.866
10–15	108.87±19.10		
>15	111.07±15.65		

* p value < 0.05: statistically significant difference

skills had no significant association in the present study. In other words, theoretical knowledge cannot guarantee clinical skills of the participants. But in the study by Studnek and colleagues, there was a significant association between the practical and theory exam.[27] However, comparison of different groups regarding professional experience and education in trauma with theoretic knowledge and clinical skills revealed a significant difference between professional experience and functional scores of the participants that was prominent between professional experience of 2–5 years and over 5 years. Comparing the results with the study by Fallahi Khoshknab and colleagues showed that having work experience does not lead to higher clinical skills and even those who had a professional experience of over 16 years had the lowest score.[8] Regarding the results of the later-mentioned study, it could be stated that the reason of this difference can show the role of clinical experience and functional skill, beside the theoretical knowledge, and also, shows the weak role of education that can be viewed from two dimensions; whether the education was not appropriate or learners have not paid enough attention to it.

Table 7: The results of Scheffe *post hoc* test

Group (years)	Group (years)	Mean difference	*P*
<2	2–5	7.20	0.350
	>5	−4.78	0.615
2–5	>5	−11.98	0.012*

* p value < 0.05: statistically significant difference

CONCLUSION

The results of this study showed that the majority of emergency medical personnel working in emergency centers of Alborz University of Medical Sciences, Tehran, Alborz province, had an acceptable level of knowledge and skills in pre-hospital trauma care, but considering the significant gap between the obtained score and the ideal level, the importance of the emergency medicine staff's work as the first responders, and the high rate of accidents, and natural and human-made disasters in our country, it is expected that with high-quality education, this hard-working group can be enabled to provide satisfactory service and reduce rates of mortality and morbidity.

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