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The effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of pre-hospital emergency staff in the academic hospitals of Ahvaz Jundishapur university of medical sciences

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Abstract

Introduction: In recent decades, E-learning has gained widespread recognition globally as a vital application of information and communication technology.

Objectives: The present study investigated the effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of pre-hospital emergency staff.

Patients and Methods: This study was a semi-experimental interventional study, and the study population consisted of the pre-hospital emergency staff of Ahvaz university of medical sciences academic hospitals in 2021. The study tool was a questionnaire on the awareness and performance of the triage system of hospital emergency (ESI). Initially, both questionnaires were completed, and submitted the triage training file to the intervention group. Two weeks after the first phase—completion of the questionnaire for the first time—and the study of the file by the subjects, the questionnaire was completed again by the intervention group, and the data of both groups were compared.

Results: According to the results, the mean of awareness and decision-making in the control group before and after the intervention was (11.8, 10.85, and 13.82) and (7.51, 7.36, and 8.86) respectively. The results indicate that non-attendance triage training based on the ESI-IV system was effective in the knowledge and ability of the pre-hospital emergency personnel had a positive and significant impact, and remains at a good level.

Conclusion: The present results of the research indicate that the use of non-attendance training as an effective method can improve interns' knowledge and ability.

Introduction

Emergency situations are referred to as perilous situations in which a person's mental or physical condition is suddenly disturbed and in urgent need of quick, fundamental, and appropriate measurement. The term triage is a scientific term in emergency medicine that has been used for over 30 years (1). The dynamic decision-making that prioritizes people's needs for receiving medical care when referred to the emergency ward is called triage (2).

Triage is conducted at two levels—prehospital and in-hospital. In normal situations, due to the limited space of a hospital, the small number of staff and equipment, or in critical situations, as the

Key point

Overall, this study focused on assessing the impact of non-attendance triage training using the ESI-IV system on the knowledge and ability of pre-hospital emergency staff. The results indicated positive and significant improvements in these areas, highlighting the potential of non-attendance training as an effective educational method.

number of patients increases, the ability to treat all patients dwindles, and the patients need to spend more time to receive appropriate treatment (3). The term triage was first used by one of Napoleon's army doctors named Dominique John Leary, to classify the wounded soldiers. This French surgeon served in Napoleon's army between



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1797-1815 and was given the title of Baron because of his services. In the second decade of the 20th century, as medical care became hospital-centered, patient treatment became more specialized. In the 1960s, hospital emergency rooms turned into emergency departments, and the need to classify patients was debated from the early 1970s, providing the ground to talk about the term triage once again as a response to the dumping problem in the emergency department (4). The structure of the ESI triage system is based on two scales—patient acuity and essential equipment for patients (resource). The former is assigned by the presence or absence of a life or organ threat or the presence of danger alarms as well as vital signs, while the latter is determined according to experimentation and comparison with similar cases. This system is a 5-level triage system that classifies patients by the acuity of the condition and the required equipment for patients in the emergency department (5,6).

Patients suffering from life-threatening conditions should be a priority for receiving urgent care. However, the high number of emergency room visits may affect the quality of care needed for these people. Proper triage can increase the quality of patient care services and satisfaction, decrease waiting time and patient stay, reduce mortality, and increase the effectiveness of emergency wards while reducing related expenses. Emergency triage aims to identify patients who need intensive and urgent care (7).

Previous studies have shown that the chief factor in emergency triage skills is the knowledge and awareness of the person performing triage of triage principles, though this connection has to be investigated further (8). In times of crisis, the pace of providing emergency services in medical centers contributes a lot to the reduction of mortality, but at the same time, assessment of emergency staff's knowledge and experience in different medical-educational centers corroborates the need for basic training and holding educational workshops in the centers in question (9,10).

As one of the most important applications of information and communication technology, E-learning has been appreciated in recent decades worldwide. This sort of education, which is known as non-physical (non-attendance and virtual) education, is a new method in the process of education with the help of new technologies and relying on the means of information technology. In virtual training, in-person training is thoroughly simulated and presented online. This educational method is practiced in two ways—online and offline. In the online method, the data exchange between professor and student is executed in live and real-time terms. Online education provides the chance for communication between students and professors, as well as questions and answers during learning and education (11). In the offline training, educational materials are made available to students through texts, audio and video, and records at another

time. This training type also allows measuring and evaluating education through tests and assignments (12).

No comprehensive research that depicts emergency staff's preparation for performing triage in times of crisis is available now. The main triage systems that have been evaluated in research papers are Canadian and Australian systems. Given that the major triage system used in Iran is ESI-IV and few studies have been done in this regard, the present research was conducted to evaluate the effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of pre-hospital emergency personnel of Ahvaz Jundishapur university of medical sciences academic hospitals.

Patients and Methods

Study design

This study was semi-experimental and interventional, and the study population consisted of pre-hospital emergency personnel of Ahvaz University of medical sciences academic hospitals in 2021. The exclusion criteria were the lack of attendance in pretest or post-test (either or both), and the lack of consent to participate in the study. The subjects were randomly split into two groups—intervention and non-intervention groups. In both groups, before the period begins, the goal of the period was explained in the first place, and a consent form was obtained. The study instrument was a questionnaire on the knowledge and performance of the hospital emergency triage system (ESI), which was in advance of this study and confirmed for reliability and validity by Zamanpour et al (1). Ten emergency medicine specialists attested to the validity of the questionnaire, and its reliability was ensured by investigating the sample population with a Cronbach's alpha coefficient of 0.85. The questionnaire included three sections: section 1, demographic information; section 2, measurement of people's awareness (17 four-choice questions and 3 two-choice (true-false) questions); section 3, measurement of people's decision-making (15 four-choice questions). Having distributed the participants randomly into two intervention and non-intervention groups in four blocks, both questionnaires were completed first, and then the triage training file as a PowerPoint file was sent to a group built in virtual space as an intervention group. An emergency medicine faculty member participated in this virtual group to inspect and provide a question/answer space. Two weeks after the first phase, i.e., questionnaire completion for the first time and the study of the file by the subjects, the intervention group again completed the questionnaire, and the data of both groups were compared.

Objectives

The present study investigated the effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of pre-hospital emergency staff.

Results

The descriptive findings of the research indicated that with respect to gender, in the intervention and control groups, the total number of participants (100%) was male because the target group was the pre-hospital emergency staff. Examining the pre-hospital emergency personnel's marital status also revealed that 73.8% of the intervention group and 71.3% of the control group were married. Examining their tenure in the emergency department in both groups also indicated that 25% of the intervention group and 40% of the control group had tenure in the emergency. The results indicated no significant difference between the two groups regarding demographic characteristics, and they are homogenous regarding demographic variables (Table 1).

Examining the respondents' ages revealed that the mean age of the intervention group was 33.83 years, and the mean age of the control group was 34.78 years, demonstrating no significant difference between the mean age of both groups ($P > 0.05$). The mean of the variables, namely duration of work in a month, duration of work in a pre-hospital emergency, and duration of work in triage, were compared in both groups, and no significant difference was observed as well, and all variables are homogenous in this respect (Table 2).

The manner of receiving triage data was also compared in both groups. The intervention group received it through academic courses (82.5%), all personnel through personal studies (18.8%), all personnel through participation in

workshops and seminars (28.7%), clinical experience (48.8%), and the internet (6.3%). However, among the pre-hospital emergency staff of the control group, they received it through academic courses (70%), personal studies (27.5%), workshops and seminars (28.7%), clinical experience (52.5%), the internet (12.5%), and other means of receiving triage information (5%). Therefore, we observe no significant difference between the means of receiving information through the Internet, workshops, and seminars, and academic courses in both groups. The intervention and control groups are homogenous and similar in terms of the manner of receiving information ($P > 0.05$; Table 2).

In what followed, the effectiveness of non-attendance triage training based on the ESI-IV system on the awareness and ability of Ahvaz's prehospital emergency personnel was investigated. Given the results, the mean of knowledge and ability in the control group, the case before and after the intervention were 11.18, 10.85, and 13.82, respectively. Comparing the means indicates that there is no significant difference between knowledge and awareness of its subscales in the control group and the case group before the intervention (Table 3). However, comparing the mean of knowledge and ability and its subscales (decision-making and awareness), a significant difference was observed in the control and case groups. That is to say, non-attendance triage training based on the ESI-IV system was effective in the prehospital emergency personnel (Table 3).

Table 1. Quantitative-descriptive indexes of prehospital emergency personnel in both control and case groups

Variable	Control		Case groups		P value
	Mean	Standard deviation	Mean	Standard deviation	
Age (y)	34.78	7.37	33.83	5.8	0.24
Working period in months	104.23	77.5	110.51	63.88	0.14
Duration of pre-hospital work	97.07	79.35	105.64	61.47	0.65
Duration of work in triage	20.11	23.12	14.42	13.79	0.87

Table 2. Qualitative-descriptive indexes of prehospital emergency personnel in both control and case groups

Variable	Category	Control group		Case group		P value
		No.	%	No.	%	
Gender	Male	80	100	80	100	0.14
Marriage	Single	23	28.8	21	26.3	0.12
	Married	57	71.3	59	73.8	
Place of internship	Emergency	32	40	20	25	0.35
	CCU& ICU department	32	40	20	25	
	Medical emergencies	75	93.8	78	97.5	
	Red Crescent	9	11.3	8	10	
	Other departments	6	7.5	8	10	
Methods of receiving information about university courses	University courses	56	70	66	82.5	0.14
	Personal studies	22	27.5	15	18.8	
	Participation in workshops and seminars	23	28.7	23	28.7	
	Clinical work experience	42	52.5	39	48.8	
	Internet	10	12.5	5	6.3	
	Other items	4	5	0	0	

Besides, we observed a significant difference between the mean of knowledge and ability and its subscales (decision-making and awareness) in the case group before the intervention and the case after the intervention (Table 4).

Discussion

The effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of Ahvaz's prehospital emergency staff was investigated. The results indicated that non-attendance triage training based on the ESI-IV system is effective in the knowledge and ability of the prehospital emergency personnel exerts positive and significant effects, and remains at a good level.

The initial descriptive findings of the study indicated that in terms of gender, 100% of the participants in both the intervention and control groups were male. This was because all participants belonged to the target group, which consisted of pre-hospital emergency personnel. The examination of respondents' ages revealed that the mean age in the intervention group was 33.83 years, and in the control group, it was 34.78 years. However, no statistically significant difference was observed in the mean ages of the two groups ($P > 0.05$).

Regarding marital status, the analysis showed that 73.8% of the intervention group and 71.3% of the control group were married. On the other hand, a comparison of marital status between the two groups revealed no significant difference ($P > 0.05$). Furthermore, the investigation into the work experience history in emergency services showed that 25% of the intervention group and 40% of the control group had previous experience in emergency services. However, no statistically significant difference was observed between the two groups in terms of this variable.

The means of the variables related to months of service, months of service in pre-hospital emergency care, and months of service in triage were compared between

the two groups. In the intervention group, these means were 110.51 months, 105.64 months, and 14.42 months, respectively. In the control group, the corresponding means were 104.23 months, 97.07 months, and 20.11 months. In this regard, no significant differences were observed in the demographic characteristics.

The results obtained from the statistical analysis of the data indicated that there was no statistically significant difference between the intervention and control groups in terms of demographic characteristics. This suggests that the two groups were homogenous with respect to these variables.

In the study conducted by Sarikaya and colleagues in 2004 at Dokuz Eylul University school of medicine in Izmir, Turkey, 8 emergency technicians were studied. The study was carried out as an intervention and consisted of three phases: pre-training, during training, and post-training. The technicians participated in a two-hour triage workshop based on up-to-date textbooks. Before the training, there was a lack of coordination between the technicians' and emergency physicians' evaluations in patient triage. However, after the training, this coordination in triage evaluations increased, indicating the role of education. The results of this research demonstrate that triage systems need to be better taught among emergency technicians, nurses, and physicians involved in triage for improved triage (13).

In a review article conducted by Considine and colleagues in 2007, Medline articles from 1966 to 2005, and CINAHL articles from 1982 to 2005 were collected using keywords such as triage, triage decision-making, and clinical decision-making. Multiple studies indicated that higher levels of deducible information lead to better triage decision-making. The foundation of many triage training programs is based on the premise that increasing information will result in improved decision-making,

Table 3. Comparing the awareness and decision-making and overall scores of the questionnaire in the control groups and case groups before and after the intervention

Variable	Control Mean ± SD	Case groups			
		Before the intervention		After the intervention	
		Mean ± SD	P value	Mean ± SD	P value
Awareness	11.18±1.5	10.85 ± 2.71	0.098	13.82 ± 2.04	0.001
Decision-making	7.51±1.67	7.36 ± 1.68	1	8.86 ± 1.46	0.001
Overall scores	18.7±2	18.21 ± 3.35	0.79	22.69 ± 2.63	0.001

SD, Standard deviation.

Table 4. Comparing the awareness and decision-making and overall scores of the questionnaire in the case group before the intervention and the case group after the intervention

Variable	Case groups		P value
	Before the intervention	After the intervention	
	Mean ± SD	Mean ± SD	
Awareness	10.85±2.71	13.82±2.04	0.001
Decision-making	7.36±1.68	8.86±1.46	0.001
Overall scores	18.21±3.35	22.69±2.63	0.001

SD, Standard deviation.

although these programs provide knowledge acquisition without practical experience. Nevertheless, studies suggest that while information acquisition and experience are closely related, information plays a more effective role in triage decision-making (14).

In the study conducted by Zamanpour et al at Tabriz university of medical sciences on the ESI triage system, 115 medical students who passed the emergency medicine unit were studied in the period of July 2018 to June 2019. The results indicated that the average score of the case group students before the training was 17.13 ± 4.26 and 24.93 ± 3.20 after the training, which is a significant difference. The findings indicate that ESI triage-based training makes a difference in students' knowledge and decision-making (1).

In the study by DeBehnke et al (15), the mean scores of medical interns significantly increased following a training course. Moreover, Sheperd's results indicated that theoretical and practical training under the exhausting conditions of the emergency should not be overlooked.

A study was conducted in the emergency department of an academic hospital in California by Fernández-Frackelton et al. In this research, 31 third and fourth-year medical students were theoretically and practically trained for a bedside ultrasound curriculum during a one-month emergency period. At the end of the course, their skills in performing and interpreting ultrasound significantly increased (16).

Conclusion

The prevalence of the corona virus has made the educational system face some challenges. Changing the method of in-person training into non-attendance training has concerned medical professors, students, interns, doctors, nurses and emergency personnel. In this study, we dealt with the effectiveness of non-attendance triage training based on the ESI-IV system on the knowledge and ability of the prehospital emergency personnel of Ahvaz. The studies conducted acknowledge the entire results of the effectiveness of distance learning on the knowledge and ability of students, interns, and personnel. The results of the research indicate that, in the conditions where the world is faced with various crises and prevalent diseases and the educational systems have undergone changes, the use of virtual education systems and tools is a good solution to empower prehospital emergency personnel.

Limitations of the study

One of the limitations of this research was the use of cross-sectional study design. One of the limitations of the study can be attributed to a decrease in the number of participants, which was itself an unsurprising issue.

Authors' contribution

Conceptualization: Ali Vefagh Nematollahi, Alireza Rafati Navaei.

Data curation: Ali Vefagh Nematollahi, Maryam Asiaban, Mofid Hosseinzadeh.

Formal analysis: Payam Amini.

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Investigation: Alireza Rafati Navaei, Maryam Asiaban, Mofid Hosseinzadeh.

Methodology: Payam Amini, Maryam Asiaban.

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Supervision: Ali Vefagh Nematollahi, Maryam Asiaban.

Validation: Payam Amini.

Visualization: Mofid Hosseinzadeh.

Writing-original draft: Maryam Asiaban, Mofid Hosseinzadeh.

Writing-review & editing: Alireza Rafati Navaei, Ali Vefagh Nematollahi.

Ethical issues

The research adhered to the principles of the Declaration of Helsinki. Approval for this study was obtained from the Ethics Committee of Golestan Hospital (Ethical code# IR.AJUMS.HGOLESTAN.REC.1399.162). Prior to any intervention, written informed consent was obtained from all participants. This study was extracted from the M.D. thesis of Maryam Asiaban at this university (#Thesis U-99366). The authors have completely observed ethical issues (including plagiarism, data fabrication, and double publication).

Conflicts of interest

The authors declare that they have no competing interests.

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