The impacts of head trauma management education on the clinical decision-making of pre-hospital emergency staff

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Abstract:

BACKGROUND: The aim of this study was to compare the effectiveness of head trauma management education by the scenario method versus lecturing on clinical decision-making by pre-hospital emergency staff.

MATERIALS AND METHODS: This was an educational trial on 60 pre-hospital emergency staff, performed in Saveh in 2020–2021. The participants fulfilling inclusion criteria entered the study and were randomly allocated to two groups: scenario (n = 30) and lecture (n = 30). Clinical decision-making scores for head trauma patient management were determined at the beginning and end of the study using a researcher-made questionnaire. Data were analyzed using descriptive and inferential statistics and SPSS software version 16.

RESULTS: At post-intervention, the mean score of clinical decision-making was 75.28 ± 11.7 in the scenario group and 68.55 ± 11.91 in the lecture group. The results of the independent t-test showed that the mean score of clinical decision-making was significantly higher in the scenario group compared with the lecture group (p = 0.04). The results of paired t-test showed a significant increase in the mean score of clinical decision-making in both groups after the intervention (p < 0.05); however, the mean of increment was higher in the scenario group (9.77 ± 7.63) than in the lecture group (1.79 ± 3).

CONCLUSION: Regarding the impact of scenario-based education on learners' intellectual abilities and creativity, it seems that this type of education can be an appropriate alternative to traditional educational methods. Therefore, it is suggested to incorporate this method in the training programs of pre-hospital emergency staff.

Keywords:
Clinical decision-making, emergency medical service, head injury, teaching methods

Introduction

One of the common types of traumas, which is associated with a high mortality rate, is head trauma. Head trauma is one of the main causes of mortality and morbidity and has been recognized as a major health care problem affecting 10 million people around the world, especially men, each year.[1] Head traumas are among the most dreadful physical injuries and the leading causes of death in car accidents.[2] In the United States, about 1.7 million people are annually affected by head traumas. In Iran, head trauma is one of the most common injuries and the most damage-causing mechanism of road accidents.[3] Dealing with head trauma patients is one of the most serious and challenging conditions faced in emergency situations. The proper management of head trauma patients is critical for their favorable prognosis,[4] and one of the most important determinants in this process is correct clinical decision-making.[5]

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Clinical decision-making is the process of information analysis, decision-making, and proper implementation of these decisions in the clinical setting.[6] Clinical decision-making is one of the most important processes constantly used by pre-hospital emergency staff for patient care provision.[7] Correct decisions can reduce costs, expedite patient recovery, optimize the use of human resources and equipment, and finally improve patient care quality. On the opposite side, incorrect decisions delay patient recovery and reduce the quality of patient care by causing difficulties to the therapeutic course and patient care process and wasting resources.[8] Using appropriate educational methods can promote decision-making skills in emergency situations.[5] One of the leading educational programs in the field of trauma patient care and management during pre-hospital emergencies is the pre-hospital trauma life support (PHTLS) plan, widely implemented by a combination of training methods, including lecturing, scenario, and clinical simulation, throughout the world.[9] The results of a study by Lindstrom and Nilsson showed that the issue of clinical decision-making had received less attention in the training programs of pre-hospital emergency staff. Also, qualitative studies conducted in Iran have reported poor abilities of critical thinking and clinical decision-making among emergency staff.[10] The scenario educational method is among novel teaching techniques that, by relying on the active participation of learners, aims to help them develop their skills through discussion, problem-solving, and evoking their abilities and creativity.[11] The scenario-based educational method by creating a sense of curiosity and interest in learning can play an effective and efficient role in motivating people, changing their attitudes, and boosting their learning abilities and scientific awareness, which ultimately raise a sense of self-efficacy.[12] Given the importance of correct clinical decision-making and taking appropriate measures at the right time to improve the prognosis of head trauma patients, especially at the pre-hospital phase, it is critical to upgrade the clinical decision-making skills of pre-hospital emergency staff, a phenomenon that needs extensive studies to find suitable educational methods for this purpose. Therefore, the present study aimed to compare the efficiency of head trauma patient management education using the scenario method versus lecturing in boosting the clinical decision-making skills of pre-hospital emergency staff.

Materials and Methods

Study design/setting

This was an educational trial on 60 pre-hospital emergency staff, aiming to compare the effectiveness of head trauma management patient education using the scenario-based versus lecturing training methods in boosting clinical decision-making skills of pre-hospital emergency staff working at the medical emergency and accident management center of Saveh.

Study participants and sampling

Inclusion criteria included having an associate's or bachelor's degree in emergency medicine, nursing, or anesthesiology, working at the medical emergency center as a caregiver, no participation in head trauma workshops during the past 2 years, and having at least 6 months of work experience at the emergency center. The subjects were excluded from the study if they decided to discontinue the training sessions or failed to attend the workshop or fill the research questionnaires completely. Based on the inclusion criteria, the subjects entered into the study by census and were briefed about the purpose of the study. The participants gave informed consent and then were asked to complete the research questionnaires. The participants were randomly assigned to the scenario and lecture groups using a table of random numbers.

Data collection tool and technique

Data collection tools included a researcher-made clinical decision-making questionnaire for head trauma patient management. The questionnaire was designed based on a referral situation that placed learners in a hypothetical clinical situation to assess their skills. The questionnaire consisted of two parts; the first part of the questionnaire addressed demographic information, including age, sex, education level, duration of working, marital status, and occupational rank, and the second part of the questionnaire was related to clinical decision-making for head trauma patient management. The questions of this questionnaire were designed based on a pamphlet based on the clinical decision-making protocol for head trauma patients. The questionnaire consisted of 30 questions and had a total score of 100, with a higher score indicating better clinical decision-making. The content validity of the items was reviewed and verified by five internal surgery and special nursing professors at the nursing schools of Saveh and Arak Universities of Medical Sciences, a professor of anesthesiology working at the intensive care unit, and one emergency medicine specialist. The face validity of the questionnaire was reviewed and confirmed by 15 pre-hospital emergency staff of Zarandieh hospital. The reliability of the questionnaire was approved by the test–re-test method. For this, the questionnaire was given to 15 technicians working at Zarandieh hospital (but not Saveh hospital, which was the study location, to avoid the disclosure of the questions). Then the questionnaire was given to the same technicians again after 15 days, and after that, the total scores of the first and second steps were independently entered into SPSS software. The correlation coefficient between the scores was calculated as 90% ($r = 90\%$). The lecture group consisted of 30 people who received head

trauma management education during two separate days (15 people per day) in one 2–3-hour session by the lecturing method. The educational content included a head trauma pamphlet prepared based on a book entitled "Pre-hospital Medical Emergencies" published under the supervision of Iran's Ministry of Health and Medical Education as well as the PHTLS reference. The scenario group consisted of 30 people who received head trauma patient management education during two separate days (15 people per day) in a 4-hour session (one session per day) by the scenario method. In the lecture group, the educational content (a comprehensive head trauma pamphlet) was presented to the audience by slides, and their questions were answered. In the scenario group, an introduction about head trauma and its treatment and care methods was initially provided. Then the participants were divided into five groups of three members, and each group was given a sheet in which an emergency situation of a hypothetical head trauma patient was presented according to the existing trained protocol. Then each group was asked to present the most appropriate scientific and practical actions based on their experiences and the information received in the training session. They were finally requested to summarize their conclusions and write their answers. In the end, one member, as a representative of each group, presented the solutions and the most principled actions regarding the relevant scenario to the audience, and other groups then started to discuss the situation. It is noteworthy that each group was given a different scenario, and a total of ten scenarios were presented during the 2 days of the workshop. The hypothetical scenarios for head trauma patients were designed after holding several discussion and counseling sessions with an experienced PHTLS expert and by referring to pre-hospital emergency books and head trauma pamphlets based on relevant protocols, and their content validity was approved by several nursing and emergency medicine professors. Two weeks after the training sessions, the participants of both scenario and lecture groups were asked to refill the research questionnaire. Finally, the scores obtained from the questionnaires were compared between the two groups and before and after the training session. All the training sessions held for the lecture and scenario groups were taught by the researcher with the assistance of a member of the education committee of the medical emergency and accident management center of Saveh.

Statistical analysis

For data analysis, descriptive statistics (frequency, percentage, mean, and standard deviation) was used to present demographic variables, and inferential statistics, including the independent t-test, paired t-test, and Chi-square, was used for between- and within-group comparisons.

Ethical considerations

This research was approved by the Research Council and the Ethics Committee of Arak University of Medical Sciences with the ethics code of IR.ARAKMU. REC.1399.342.

Results

Five members of the lecture group, who did not attend the class, were excluded from the study, so the final data analysis was performed on 55 subjects. The mean age of the participants was 30.91 ± 6.06 years (the range of 23–45 years). Forty-seven (85.5%) of the participants were male, and eight (14.5%) were female; twenty-one (38.2%) of them were single, and 34 (61.8%) were married. Out of the 55 participants, 25 (45.5%) were nurses, 29 (52.9%) were medical emergency technicians, and one (1.8%) was an anesthesiologist. Twenty-two (40%) of the participants had associate degrees, 31 (56.4%) had bachelor's degrees, and two (3.6%) had master's degrees. The mean duration of work experience was 6.36 ± 4.66 years (the range of 1–22 years) [Table 1 and 3].

The mean clinical decision-making score before intervention was 65.51 ± 12.58 in the scenario group and 66.75 ± 12.06 in the lecture group, and the independent t-test showed that the difference between the two groups was not statistically significant ($p = 0.712$). After the intervention, however, the mean score of clinical decision-making was 75.28 ± 11.7 in the scenario group and 68.55 ± 11.91 in the lecture group, and according to the independent t-test, the mean score was significantly higher in the scenario group versus the lecture group ($p = 0.04$) [Table 2 and Figure 1]. The results of the paired t-test showed that changes in the

Table 1: Participants' Demographic Information in the Study Groups

Variables	*n* (%)		*P*
	Lecture Group	Scenario group	
Age (year)	33.04±6.5	29.13±5.13	0.012
Years in service	7.6±5.03	5.33±4.14	0.065
Gender			
Male	24 (96)	23 (76.7)	0.059
Female	1 (4)	7 (23.3)	
Marital status			
Single	9 (36)	12 (40)	0.788
Married	16 (64)	18 (60)	
Education level			
Associate's degree	13 (52)	9 (30)	0.128
Bachelor's degree	12 (48)	19 (63.3)	
Master's degree	0 (0)	2 (6.7)	
Job position			
Nurse	7 (28)	18 (60)	0.014
Emergency medical technician	18 (72)	11 (36.7)	
Anesthesiologist	0 (0)	1 (3.3)	

Table 2: Clinical decision-making scores in the scenario and lecture education groups before and after the intervention

Clinical decision-making score	Mean (SD) Scenario-based education	Mean (SD) Lecture-based education	P*
Pre-intervention	65.51 (12.58)	66.75 (12.06)	0.712
Post-intervention	75.28 (11.7)	68.55 (11.91)	0.04
P**	<0.001	0.006	

*Independent *t*-test, **Paired *t*-test

Table 3: Covariance analysis results

Source	Sum of squared	Degree of freedom	Mean of squared	F	P
Constant	2267.402	1	2267.402	16.547	<0.001
Age	349.155	1	349.155	2.548	0.117
Job position	179.984	1	179.984	1.314	0.257
Group	976.965	1	976.965	7.130	0.01
Error	6988.307	51	137.026	-	-
Total	294910.820	55	-	-	-

Figure 1: The mean and standard deviation of clinical decision-making in the study groups

mean score of clinical decision-making were ascending and statistically significant in both groups (p < 0.05), and the mean change in this score was higher in the scenario group (9.77 ± 7.63) compared with the lecture group (1.79 ± 3) [Table 2].

Discussion

In this education trial study, we compared the effectiveness of head trauma patient management training using the scenario method versus lecturing in improving the clinical decision-making of pre-hospital emergency staff. The results of this study showed that the mean score of clinical decision-making after the intervention was significantly higher in the scenario group than in the lecture group. This indicated the superiority of the scenario educational method in promoting the clinical decision-making skills of pre-hospital emergency staff during head trauma patient management. In line with the findings of this study, Steratore *et al.* stated that the use of modern training methods, including scenario simulation, could significantly boost the performance and communication skills of pre-hospital emergency staff during trauma patient management.[13] In line with the present study, Jafarizadeh *et al.* also noted that a scenario-based educational method, compared with a participatory method, considerably improved basic and advanced knowledge about cardio-pulmonary resuscitation among medical emergency technicians.[14] In the present study, although both of the educational interventions significantly improved the clinical decision-making score, the mean change in the score was significantly higher in the scenario group than in the lecture group, indicating the greater impact of the scenario-based educational method. This can be explained by the active
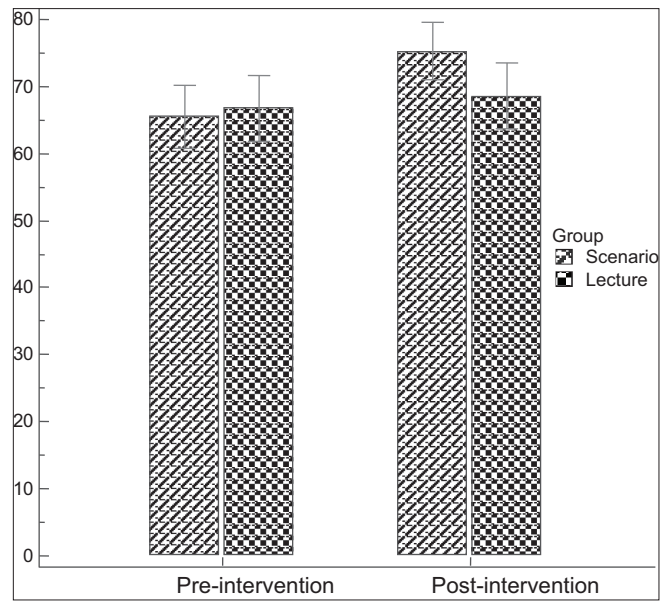
participation of the subjects and mutual discussions during the scenario-based educational method. Teuben *et al.* also confirmed the findings of the present study and stated that the implementation of PHTLS algorithms and its related scenarios for the management of trauma patients improved the efficiency of pre-hospital staff in providing care for trauma patients.[9] In line with the present findings, Esmailzadeh *et al.* in their study clarified that the implementation of a training program for trauma patients promoted the clinical decision-making skills of medical emergency technicians.[10] In another study, a higher average knowledge was reported in the scenario group than in the lecture group, indicating that the scenario-based educational method was more efficient and effective compared with conventional methods such as lecturing.[12] In parallel with the findings of the present study, a review of the literature shows that the use of active educational methods promotes clinical decision-making in emergency situations. In this vein, the results of Sadegh Nejad *et al.*'s study showed that both the concept map method and the clinical simulation method could upgrade the clinical decision-making skills of emergency medical students.[15] The results of the present study revealed a significant elevation in the mean scores of clinical decision-making in both groups of lecturing and scenario-based education (P < 0.05) compared with pre-intervention; however, this increase was more prominent in the scenario-based group. Consistently, Sharifi *et al.* declared that the scenario educational method, compared with the lecture method, had a superior effect on the knowledge, attitudes, and performance of medical emergency staff in controlling bleeding in trauma patients.[16]

Limitations

One of the limitations of the present study was that a number of the selected participants could not attend the scheduled educational sessions because of having another job or the coronavirus pandemic restrictions, which reduced the final number of participants to 55. Because of the lack of similar studies, we also encountered limitations in making proper comparisons and discussions over the findings. The members of the scenario group were asked to avoid sharing information until the end of the study to prevent information as much as possible.

Conclusion

The results of the present study showed that head trauma patient management education by the scenario-based and lecturing methods improved the clinical decision-making skills of pre-hospital emergency staff, so it is recommended to integrate these educational programs into the training programs of medical emergency staff during their service. Given the importance of clinical decision-making in pre-hospital emergencies, an appropriate level of clinical decision-making skills can be regarded as a necessity for employing these staff. The results of the present study showed that both the scenario-based and lecturing educational methods significantly boosted clinical decision-making in pre-hospital emergency staff, which was in line with the well-established role of education in promoting clinical decision-making, as reported in similar studies. Considering that after the intervention a higher increase was observed in clinical decision-making scores in the scenario-based method compared with the lecturing method, it can be concluded that the scenario-based educational method is more efficient and effective than conventional methods such as lecturing.

Ethical issues

All participants gave informed consent and signed the form before entering to the study. This study has ethical approval from the Ethics Committee of Arak University of Medical Sciences (Code: IR.ARAKMU.REC.1399.342).

Declaration of patient consent

The authors certify that they have obtained all given consent forms by the patients. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of Interest

There are no conflicts of interest.

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