

The Effect of Education on Knowledge, Attitude, and the Perception of Emergency Medicine Interns about Patient Safety Principles: An Education-oriented Interventional Study

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ABSTRACT

Introduction: The present study aimed to investigate the effect of education on the attitude, knowledge, and perception of emergency medicine interns about patient safety principles. **Methods:** This was an education-oriented interventional study conducted on emergency medicine interns in Mashhad. The subjects were divided into intervention and control groups using a random number table. In the intervention group, education was based on the national patient safety protocol in the form of a group 4-hour meeting on the first or second day of introducing the interns to the ward. **Results:** A total of 163 individuals participated in this study in the educational intervention (n = 80) and control (n = 83) groups. The post-intervention results showed that the interns' perception of management and the causes of errors relatively improved in the intervention group compared to the control group (P value < 0.05). In addition, the interns in the intervention group had a higher awareness of the occurrence of errors and the error reporting systems compared to the control group (P value < 0.05). On the other hand, there was a significant difference between the interns in both groups in terms of their attitude and skills related to the patient safety principles (P value < 0.05), showing the interns' interest in learning and reporting regarding said safety principles. **Conclusion:** The results of this study show that teaching patient safety principles to emergency medicine interns had a significant positive effect on their knowledge, perception, attitude, and skills. Most of the interns acknowledged the possibility of avoiding the occurrence of errors.

Key words: Patient safety, knowledge, attitude, emergency medicine

INTRODUCTION

Along with the quantitative development and expansion of healthcare systems, maintaining and improving their quality has become one of the most important challenges for the managers of health and education systems¹⁻³. Meanwhile, one of the most obvious rights of patients is to be safe from danger and injury while accessing health services^{4,5}. Safety is one of the main pillars of quality in healthcare organizations, and creating a safe environment in which patients are not harmed by the nursing and medical services is considered to be one of their most important rights^{6,7}. According to multiple studies, in developed countries, 1 in 10 hospitalized patients receiving hospital care is injured, and it is estimated that 75% of these errors are preventable⁸.

Inadequate attention to patient safety is a latent problem in the healthcare systems of different countries, and at thousands of patients undergo unsafe care annually, more than 50% of which can be prevented^{9,10}.

Therefore, paying special attention to the gap between service delivery, service quality, and patient safety is of great importance¹¹. Numerous studies in various countries have shown that 2.9 – 16.6% of patients in acute care hospitals experience at least one adverse event. It is believed that to improve healthcare quality and patient safety, hospitals should create a patient safety culture among their staff in line with designing structural interventions². The American Institute of Medicine (IOM) has stated that the establishment of a safety culture in hospitals through which the side effects can be reported without blame, and providing an opportunity to learn from mistakes and be improved to prevent human and systemic errors in the future, will lead to improved patient safety. Thus, if hospitals want to improve patient safety, they need to have a better understanding of the patient safety culture^{12,13}. Safety culture assessments can be done to identify the safety culture and raise awareness, as well as to evaluate patient safety measures, and track changes over time and compare them^{14,15}. According

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to studies, patients in the emergency department were dissatisfied with factors such as congestion, high waiting time, inadequate services, and leaving the emergency room without receiving appropriate treatment, which in turn increased patient mortality¹⁶.

Therefore, considering the position of safety in medical care, patient safety education and changing the attitudes and perceptions of medical staff both play a key role in improving patient safety principles. The implementation of safety measures and precautions without proper assessments can increase the costs involved as well as bring in new and unexpected risks¹⁷. Due to the important role of patient safety, this study was conducted to investigate the effect of education on the knowledge, attitude, and perception of emergency medicine interns on patient safety principles.

METHODS

This education-oriented interventional study was conducted on a sample of emergency medicine interns after getting permission from the Organizational Ethics Committee of Mashhad University of Medical Sciences. All the interns had been newly introduced to the emergency medicine department and had entered the study once their informed consent was obtained. At the beginning of the course, the interns were all provided with a standard questionnaire for assessing their knowledge, attitude, and perception. They were then randomly divided into two groups using a random number table. Patient safety education was based on the national patient safety protocol and on the group 2 to 3-hour meeting on the first or second day for introducing the interns to the emergency department. The questionnaires were distributed among the interns on the first or second day of entering the emergency room after coordination with the practitioner responsible for them, and they were then collected after having been answered. A 2 to 3-hour class was held for the intervention group to teach them patient safety principles. They were taught by a single person in collaboration with the infection control supervisor of Hasheminejad Hospital. No education on patient safety was provided to the control group, though. In the end, the standard questionnaires were redistributed and the required data was collected.

In this study, the standard questionnaire used in the study was by Nabilou *et al.*¹⁴ and adopted from Leung¹⁸ and Yoshikawa¹⁹. The validity and reliability had been evaluated and it had a Cronbach's alpha of 0.72. The questionnaire consisted of two parts, the

first of which dealt with personal information and educational background, and the second part which included 26 questions on a 5-point Likert scale to determine the interns' perception of patient safety. To calculate the mean score of each dimension, the sum of the scores of each dimension was obtained by dividing it by the number of questions. The mean scores of the two groups were compared. A high mean score in each dimension reflected the interns' low perception, knowledge, attitude, and skills associated with the patient safety conditions, and low mean scores indicated the interns' improved perception, knowledge, attitude, and skills.

Statistical Analysis

Descriptive statistical methods such as the mean and standard deviation were used to describe the data. The Chi-Square and Fisher Exact tests were also used to investigate the frequency distribution of the qualitative variables. In addition, the independent t-test was used to investigate the difference between the mean scores of the quantitative variables with a normal distribution in the intervention and control groups, and the paired t-test was also applied to examine the mean differences of the quantitative normal variables before and after the intervention. The statistical analysis was performed using Stata software (Corp., College Station, Texas) version 12 and the significance level in this study was > 0.05 .

RESULTS

A total of 163 individuals participated in this study in the intervention ($n = 80$) and control ($n = 83$) groups, of whom 54.60% were female ($n = 89$) and 45.40% were male ($n = 74$). The mean age of the subjects was 34.95 ± 3.91 years. Examining the previous knowledge of the subjects on patient safety principles showed that about 48.15% (78 individuals) had previous knowledge and 51.85% (84 individuals) did not have sufficient information about patient safety.

Studying the interns' perceptions of patient safety principles in the beginning of the research indicated that 42.33% of the subjects agreed with the inevitability of medical errors. On the other hand, 39.88% of the participants agreed that there was a difference between the best care from the viewpoint of physicians and day care. In addition, 25.15% of the subjects disagreed that if they witnessed a medical error, they would not talk about it with anyone. Furthermore, 36.81% of the interns believed that after the occurrence of an error, a more effective, more powerful, and more accurate strategy needs to be applied. Finally, 28.83% of the subjects opposed the claim that

Table 1: Basic information on interns' perceptions of patient safety principles

Variable	Totally agree	Agree	No idea	Disagree	
Perceptic Medical errors are inevitable.	21 (12.88%)	69 (42.33%)	25 (15.34%)	27 (16.56%)	21 (12.88%)
There is a difference between "the best care from doctors' perspective" and "day care".	18 (11.04%)		39 (23.93%)	19 (11.66%)	22 (13.50%)
Possibility of committing traumatic medical errors by qualified physicians	11 (6.75%)	13 (7.98%)	54 (33.13%)	54 (33.13%)	31 (19.02%)
Most medical errors are related to what staff can prevent.	39 (23.93%)	54 (33.13%)	44 (26.99%)	19 (11.66%)	7 (4.29%)
If I see a medical error, I will not share it with anyone.	15 (9.20%)	35 (21.47%)	44 (26.99%)	41 (25.15%)	28 (17.18%)
If the patient is not harmed, it is not needed to refer to it as a medical error.	7 (4.29%)	21 (12.88%)	40 (24.54%)	63 (38.65%)	32 (19.63%)
Only doctors can determine the causes of a medical error.	30 (18.40%)	41 (25.15%)	31 (19.02%)	46 (28.22%)	15 (9.20%)
Reporting systems will significantly contribute to reducing similar errors in the future.	29 (17.79%)	38 (23.31%)	33 (20.25%)	42 (25.77%)	21 (12.88%)
After an error occurs, a more effective, more powerful, and more accurate strategy must be applied.	43 (26.38%)	60 (36.81%)	30 (18.40%)	20 (12.27%)	10 (6.13%)
Physicians should not accept uncertainty about patient care.	28 (17.18%)	56 (34.36%)	33 (20.25%)	27 (16.56%)	19 (11.66%)
The culture of medicine constructively makes it easier for health-care providers to deal with medical errors.	26 (15.95%)	55 (33.74%)	41 (25.15%)	19 (11.66%)	22 (13.50%)
Doctors report medical errors on a daily basis.	30 (18.40%)	36 (22.09%)	31 (19.02%)	47 (28.83%)	19 (11.66%)

physicians reported medical errors on a daily basis (Table 1).

The results of examining the interns' knowledge of patient safety principles at the beginning of the study clearly show that 34.97% of the subjects were unaware of the number of annual adverse events preventable by the responsible authorities, 34.36% were unaware of the number of unwanted complications preventable by the responsible authorities, and 7.98% were fully aware. In addition, the results of estimating the percentage of hospitalized patients due to adverse events showed that 31.29% of the subjects were unaware of the estimate and only 7.36% were fully aware. Besides, 25.77% and 24.54% of the subjects were un-

aware of the characteristics of a successful reporting system for medical errors and patient safety, respectively (Table 2).

The results of studying the interns' attitudes and skills of patient safety principles before the educational intervention showed that 24.54% of the subjects agreed to be trained in patient safety in the future, that 29.45% agreed that patient safety training was worth spending time on in university, and that 28.8% agreed that patient safety education was an important issue. In terms of skills, the results showed that 29.45% of the surveyed interns agreed that they could investigate the cause of a medical error. Furthermore, 30.06% of the subjects completely agreed with sharing medical

Table 2: Basic information on the interns' knowledge, attitude, and skills of patient safety principles

Variable		Totally informed	Informed	No idea	Uninformed	Totally uninformed
Knowledge	the number of preventable adverse events per year by the responsible authorities of the country	16 (9.82%)	20 (12.27%)	43 (26.38%)	57 (34.97%)	27 (16.56%)
	the number of preventable complications per year by the responsible authorities of the country	13 (7.98%)	17 (10.43%)	52 (31.90%)	56 (34.36%)	25 (15.34%)
	estimation of the percentage of patients hospitalized due to adverse events	12 (7.36%)	21 (12.88%)	39 (23.93%)	51 (31.29%)	40 (24.54%)
	characteristics of a successful medical error reporting system	18 (11.04%)	31 (19.02%)	40 (24.54%)	42 (25.77%)	32 (19.63%)
	determining latent causes of errors in the system	22 (13.50%)	31 (19.02%)	48 (29.45%)	36 (22.09%)	26 (15.95%)
	patient safety	23 (14.11%)	37 (22.70%)	39 (23.93%)	40 (24.54%)	24 (14.72%)
Attitude	Physicians should routinely spend part of their time improving patient care.	33 (20.25%)	56 (34.36%)	28 (17.18%)	26 (15.95%)	20 (12.27%)
	Patient safety education is an important issue	27 (16.56%)	47 (28.8%)	33 (20.25%)	29 (17.79%)	27 (16.56%)
	Patient safety education is worth spending time in university	35 (21.47%)	48 (29.45%)	33 (20.25%)	29 (17.79%)	18 (11.04%)
	I would like to learn more about patient safety in the future	36 (22.09%)	40 (24.54%)	29 (17.79%)	32 (19.63%)	26 (15.95%)
Skill	Deciding how to respond to a medical error	36 (22.09%)	43 (26.38%)	34 (20.86%)	32 (19.63%)	18 (11.04%)
	I can look into a case to find the cause of a medical error	21 (12.88%)	34 (20.86%)	37 (22.70%)	47 (28.83%)	24 (14.72%)
	What the attitude is towards sharing a medical error with the patient.	38 (23.31%)	48 (29.45%)	31 (19.02%)	29 (17.79%)	17 (10.43%)
	What the attitude is towards sharing a medical error with a professor.	49 (30.06%)	42 (25.77%)	36 (22.09%)	23 (14.11%)	13 (7.98%)

Table 3: Mean scores of interns' perceptions, knowledge, attitudes, and skills of patient safety principles by prior knowledge and gender before the educational intervention

	Variable	Perception	Knowledge	Attitude	Skill
Gender	Male	35.17±0.53	19.95±0.35	11.29±0.28	10.95±0.29
	Female	34.22±0.46	19.69±0.25	11.02±0.28	10.84±0.28
	P value*	0.18	0.541	0.498	0.776
Prior knowledge of patient safety principles	Yes	35±0.47	19.38±0.30	11.76±0.29	10.83±0.31
	No	34.33±0.52	20.21±0.30	10.60±0.26	10.92±0.26
	P value*	0.35	0.054	0.003	0.817

Table 4: Mean scores of interns' perceptions, knowledge, attitudes, and skills of patient safety principles before and after the intervention

Component		Intervention group	Control group	P value*
Pre-intervention	Perception	35.02 ± 0.52	34.30 ± 0.47	0.307
	Knowledge	19.56 ± 0.31	20.06 ± 0.28	0.244
	Attitude	10.83 ± 0.25	11.44 ± 0.30	0.131
	Skill	11.21 ± 0.25	10.59 ± 0.31	0.127
Post-intervention	Perception	34.62 ± 4.01	35.22 ± 4.64	0.077
	Knowledge	15.62 ± 2.78	18.91 ± 2.90	0.001
	Attitude	9.46 ± 2.46	10.86 ± 2.36	0.003
	Skill	9.83 ± 2.57	11.50 ± 2.45	0.001

Table 5: Comparison of mean scores of interns' perceptions, knowledge, attitudes, and skills of patient safety principles before and after the intervention in the intervention group

Component	Pre-intervention	Post-intervention	P value
Perception	35.02 ± 0.52	34.62 ± 4.01	0.408
Knowledge	19.56 ± 0.31	15.62 ± 2.78	0.001
Attitude	10.83 ± 0.25	9.46 ± 2.46	0.001
Skill	11.21 ± 0.25	9.83 ± 2.57	0.001

errors with their professors, and 29.45% agreed with sharing medical errors with the patients (Table 2).

The mean scores of the interns' perceptions, knowledge, attitudes, and skills in relation to the patient safety principles approached by gender and prior knowledge of the issue as presented in Table 3 indicates no significant difference between men and women in terms of the four mentioned factors (P value > 0.05). Regarding prior knowledge of the patient safety principles, the results show that the attitude of the individuals with and without previous knowledge was 11.76 and 10.60, respectively, which was statistically significant (P value = 0.003). The results also indicate well that the interns' perception, knowledge, and skills have no relationship with their previous knowledge (P value > 0.05) (Table 3).

Studying the subjects' perceptions, knowledge, attitudes, and skills of patient safety principles before the intervention showed that the mean scores of perception in the intervention and control groups were 35.02 and 34.30, respectively, implying no significant difference between the two groups before the intervention in terms of their perceptions (P value = 0.307). The interns' scores for their knowledge of patient safety principles were 19.56 and 20.06 in the intervention and control groups, showing no significant difference

between the two groups in terms of their knowledge of the principles (P value < 0.244).

In addition, the mean scores for attitudes and skills in the intervention group were 10.83 and 11.21, respectively, and 11.44 and 10.59 in the control group. Thus, no significant difference was found between the two groups in terms of attitude (P value = 0.131) and skills (P value = 0.127) regarding patient safety principles before the educational intervention. There were no educational groups in both groups before the intervention. However, the post-intervention knowledge, attitudes, and skills of the interns in the two groups were significantly different (P value < 0.05) (Table 4). The total scores of the interns' perceptions, knowledge, attitudes, and skills regarding the patient safety principles before and after the intervention showed that the knowledge, attitudes, and skills in the intervention group were significantly different before and after the intervention (P value < 0.01) (Table 5).

DISCUSSION

Patient safety is critical in relation to improving healthcare quality and it is monitored and evaluated as an important parameter by all healthcare providers around the world³. Considering the emphasis of the

World Health Organization on patient safety education, the results of this study show that providing patient safety education to interns significantly increased their perceptions, knowledge, attitudes, and skills compared to the control group. As one of the studies conducted in the field of safety, the present research obtained significant results on the role of education in increasing knowledge, attitudes, and skills of interns, and the relative difference between the students' relative perceptions of patient safety principles, their levels of awareness, and the necessity of patient safety education in particular.

Numerous studies have examined the extent of the sampled interns' knowledge and their awareness of patient safety principles. Nabilou *et al.*¹⁴ conducted a study to assess the knowledge, attitude, and perception of interns, nursing, and midwifery students about patient safety principles and found that over 50% of the students were optimally aware of patient safety principles and were interested in learning about it. The results of the present study also show that an educational intervention significantly increased the interns' levels of knowledge, perception, attitude, and skills compared to the control group. This meant that the subjects in the intervention group had a higher awareness of the number of adverse events, of the estimation of the percentage of hospitalized patients due to adverse events, of the features of a successful medical error reporting system, and of the determination of latent error causes in the system.

In the study by Abdi *et al.*²⁰ on the changes in the knowledge, attitudes, and skills of medical students about patient safety principles, it was found out that the students' error management, error determination, error reporting of non-serious injuries, reporting system, and medicine culture scores were significantly different before and after the intervention which is in line with the results of the present study. In their study, Ginsburg *et al.*²¹ investigated the effect of an educational program based on patient safety culture among nurses, and showed that teaching patient safety principles significantly improved the safety culture in the intervention group compared to the control group.

Pakzad *et al.*² studied the effect of a virtual patient safety educational program and lecture on the sampled nurses' patient safety culture, and they indicated that after the educational intervention, the patient safety culture had significantly increased in both virtual education and lecture groups. This was in line with the results of the study conducted on emergency medicine interns. In addition, the results of the study by Pakzad showed that the mean score of the

e-learning group was significantly higher than that of lecture-based education. However, the lack of a control group to compare the results was one of the most important limitations of their study.

In their study conducted on nurses to examine the effect of an educational program on patient safety, Azimi *et al.*²² showed that all dimensions of patient safety perceived by the nurses were significantly different after the intervention. This is consistent with the results of the present study in which the post-intervention knowledge, perception (error management and causes of errors), attitudes, and skills of the interns increased significantly compared to the control group.

Although the subjects in this study were emergency medicine interns, which was very important due to their job position as well as the congestion and the initial treatment of the patients, the importance of observing safety principles by all interns and health workers still seems to be necessary which was not considered in this study. In addition, the education in this study was provided only through lectures but it seems that implementing educational programs using various methods such as operational programs in different medical sections can increase the knowledge, attitudes, and awareness of the interns. Other limitations of this study included the short interval between the education and the post test, and also the limitation present when examining the interns' skills practically due to the current research method, which requires conducting further studies in the future.

CONCLUSIONS

The results of this study clearly show that teaching patient safety principles to emergency medicine interns had a significant positive effect on their knowledge, perception, attitudes, and skills as the interns under education had a relative understanding of error management and causes. Besides this, most of the interns acknowledged the possibility of avoiding errors, the role of human factors, error reporting, reporting system, and the application of effective strategies to reduce errors. However, more studies are needed in this field.

ABBREVIATIONS

IOM: American Institute of Medicine

ED: Emergency Department

WHO: World health organization

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AUTHOR'S CONTRIBUTIONS

Hamideh Feiz Disfani proposed and designed the study, Mostafa Kamani and Seyed Mohammad Mousavi collected the Data and managing manuscripts, Mohadeseh Shourabi and Maryam Adimolmasali contributed in writing and approving the study.

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AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted in accordance with the amended Declaration of Helsinki. The institutional review board approved the study, and all participants provided written informed consent.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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