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# Effect of operational exercises on nurses' competence in dealing with disaster

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## Abstract:

**BACKGROUND:** It is necessary to assess the level of preparedness to reduce the side effects of disasters, so regarding to the role of nurses in responding to the disasters, this is of particular importance. Holding a maneuver and exercises is one of the ways to increase the level of capability and assess the level of readiness, so the aim of the current study was to investigate the impact of the implementation of the operational exercises program on the competency of nurses in disaster response in 2020.

**MATERIALS AND METHODS:** The present study is a quasi-experimental study in two groups, in which seventy nurses of hospitals affiliated to Shahrekord University of Medical Sciences were selected by census and randomly divided into two groups. Before the intervention, a native questionnaire to assess the competence of nurses in the disaster response was completed. Then, the empowerment program including educational workshop, tabletop, and operational maneuvers were performed. Immediately and 3 months after the intervention, the questionnaires for both groups were completed, and the data were analyzed using SPSS 21 through descriptive-analytical statistical tests.

**RESULTS:** The results showed that the mean score of nurses' competence in all domains of management, ethics, personal, team work, and technical immediately and 3 months after the intervention in the intervention group increased significantly ( $P = 0.001$ ), while in the control group, these changes were not significant ( $P > 0.05$ ).

**CONCLUSION:** According to the results of a recent study, the implementation of the empowerment program and the implementation of maneuvers as a part of the process of preparing nurses to deal with disasters have been effective. Therefore, it is suggested to use periodic maneuvers in in-service training programs to improve the level of competence of nurses.

## Keywords:

Disaster, nursing competency, operational maneuver

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## Introduction

Disasters have always threatened human societies, and the number and severity of disasters are increasing in all countries around the world.<sup>[1,2]</sup> Disaster is a serious disruption in the functioning of a society that leads to widespread human, economic, or environmental resources to the extent that it exceeds the ability of the society or community to adapt to its own resources.<sup>[3]</sup> According to

statistics provided in 2019 by the Center for Disaster Epidemiology Research, 348 natural disasters affected over 69 million people, killing an additional 11,804, and costing a total of US \$132 billion.<sup>[4]</sup>

Of the approximately 40 known natural disasters, 31 occur in Iran. As Iran is one of the ten most disaster-prone countries in the world and 90% of its population is exposed to the dangers of earthquakes and massive floods.<sup>[5,6]</sup> Therefore, this wide range of disasters requires the disaster preparedness team to be more prepared.<sup>[4]</sup>

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Due to the studies conducted, most nurses are not properly trained or prepared to assist during disasters so preparing them to provide care in disaster situations is of great importance and must be prepared to deal effectively and efficiently with various types.<sup>[7]</sup> The World Health Organization considers preparedness and trained personnel as one of the effective factors in reducing the rate of disaster injuries.<sup>[8]</sup>

Khankeh *et al.* also identified the trained force as one of the facilitators in providing disaster health services.<sup>[9]</sup> Nurses are recognized as the largest group of health-care workers and as key players in emergency preparedness and response, and their role in disaster response is significant.<sup>[10]</sup>

Nurses need to be competent in order to provide effective care during these difficult and complex events. Competence is defined as the ability of an individual to manage important situations or perform their professional duties properly or the practical ability to use knowledge and skills in specific situations with the acquisition of the necessary attitudes and commitments and responsibilities.<sup>[11-13]</sup> According to national and international research findings, the acquisition of technical, managerial, ethical, and personal competencies is essential for all disaster care nurses.<sup>[14-16]</sup> In different countries, studies have been conducted to examine the level of competencies mentioned in nurses, and most studies, especially in Asian countries, have shown that nurses are not sufficiently prepared to provide disaster care.<sup>[17,18]</sup>

Since nurses' lack of readiness and competence to play their role effectively and provide the care needed by disaster clients can exacerbate the problem and cause irreparable harm to victims and the community, so nurses must acquire and maintain the ability to participate effectively in providing nursing services and delivering a systematic and efficient response to disasters through exercises and maneuver. Therefore, it is necessary to assess the ability of nurses before being in real disaster situations and eliminate their shortcomings. To this end, preparing nurses to play a role in disaster situations has been one of the goals of nursing education in various countries such as the United States, Britain, and Australia in recent years.<sup>[19,20]</sup>

One of the ways to increase the skills and competence of employees is the ability that makes employees realize their weaknesses and get away from it and strengthen their skills and knowledge.<sup>[20]</sup> One of the recommended strategies to increase competency in the response phase is the use of operational exercises. Considering that holding a maneuver is one of the methods of empowering nurses, it can be used in medical centers.<sup>[21,22]</sup>

A complete and codified plan and periodic assessment of staffs is needed in all medical centers to reduce the effects of disasters.<sup>[23,24]</sup>

Despite holding periodic maneuvers in most medical centers, studies have shown that most nurses are not prepared to respond to disasters, which can be due to the lack of relevant content and appropriate educational content during their education and in-service training.<sup>[25]</sup> Regarding the summary of the topics mentioned above and the personal experience of the research team regarding the competence of nurses in disaster response and the lack of empowerment program and periodic maneuvers in our province, so this study was conducted to investigate the effect of operational exercises on nurses' competence in dealing with disaster.

## Materials and Methods

### Study design and setting

The present study was a quasi-experimental study with two groups which was conducted in 2020.

### Study participants and sampling

The sample size included seventy nurses who were enrolled in the study by census method (35 people in each group). All nurses were included in the study if they had consent and at least 1 year of nursing experience, and if they did not want to continue their cooperation, they were excluded from the study. Naghan Hospital was randomly assigned as the intervention and Ardal Hospital as the control group. Based on the study conducted by Aliakbari,<sup>[26]</sup> assuming that the competency score of nurses is equal to  $112 \pm 17$ , and during the study, the average in the intervention group was expected to increase 12 units, taking into account the 95-reliability coefficient percentage and test power of 80%, the sample size in each group was set equal to 32 people. Loss to follow-up or nonresponse of up to 10%, the sample size came out to be 70.

In the first session, the questionnaires were completed as self-report by the research samples. At this stage, a round table maneuver was held for the intervention group. In order to perform the table top maneuver, first the objectives and method of execution and grouping were introduced. Then, the scenario was presented, and the learners' report on crisis management based on scenarios was presented, and at the end, the scenarios were reviewed and analyzed.<sup>[27]</sup> The content of the scenarios was designed to cover topics in the areas of management, ethics, and technical competency. A lottery was conducted to divide individuals into groups. One commander was appointed in each group and then scenarios and implementation instructions were given to each group based on the approach (hospital incident command system [HICS]).

The commander and other team members, each with a box position in the HICS, reviewed the scenario and design an action plan for disaster management (one commander and six others in the role of a box such as operations commander, planning commander, etc.). At the end of this stage, the command of each group presented the designed programs of the group and then their summarization, analysis, and critique were done by the professors present at the meeting.<sup>[24]</sup> Finally, after coordination with the hospital crisis committee, the operational exercise was implemented in order to deepen the information and show the importance of paying attention to disaster planning in the hospital for the intervention group.

### Data collection tool and technique

Data were collected by DNCs questionnaire designed by Aliakbari *et al.* in 2013. This questionnaire is in Persian language consists of two parts. The first part addresses the demographic information and the second part consists of fifty questions, 44 of which, rated on a 5-point Likert scale from very high (5) to very low (1), assess the management competency (questions 1–12), specific personal competency (13–21), and technical competency (22–44), and 6 of which (45–50) rated on a 4-point Likert scale from rarely (1) to always (4) assess the level of ethical and legal competences of nurses in disaster response (16). The minimum and maximum attainable scores in all domains are 50 and 244, respectively; obtaining a higher-than-average score indicates the optimality of nurses' disaster response competencies. This questionnaire is a valid and reliable tool. The validity of the tool has already been investigated and approved by Aliakbari.<sup>[26]</sup> The internal consistency by Cronbach's  $\alpha$  coefficient has been reported to be higher than 0.88 for all subscales of the questionnaire and 0.96 for the whole scale. The test-retest method was also used to assess the reliability of the questionnaire. For this purpose, the questionnaire was administered to 20 nurses (not included in the main study) with a 2-week interval. The correlation coefficient between the two administrations in all subscales of the questionnaire was higher than 0.9.

Data were entered into SPSS 21 (SPSS Inc., Chicago, IL, USA) software, and data analysis was performed based on descriptive statistics including mean and standard deviation for quantitative or frequency and percentage for qualitative variables.  $P \leq 0.05$  was considered statistically significant.

### Ethical consideration

The Medical Research Ethics Committee of Shahrekord University of Medical Sciences approved the study (Ethics code IR.SKUMS.REC.1399.059). All participants who took part in the study did so according to their own free

will. Informed consent, as well as written consent, was obtained from every participant. All the data obtained from the study are kept secure and confidential.

## Results

Findings of the study regarding the demographic characteristics of the studied samples showed that out of seventy participants in the study, 13 (37.1%) were male and 22 (62.1%) were female in the control group. In the intervention group, out of 35 nurses, three were male (8.6%) and 32 (91.4%) were female. The age range of nurses was between 24 and 47 years. Other demographic characteristics of nurses in two groups are presented in Table 1.

The results showed that nurses' professional competence in the control group was ( $132.57 \pm 24.64$ ) and in the intervention group ( $121.97 \pm 19.95$ ). At the beginning of the intervention, there was no statistically significant difference between the two groups ( $P = 0.052$ ), in other words, both groups were the same in terms of nursing competencies at the beginning of the study. Immediately after the intervention and 3 months after the intervention, the variables with mean and standard deviation ( $187.11 \pm 19.57$  and  $187.25 \pm 19.72$ ) were significantly higher than the control group ( $P < 0.001$ ) Table 2.

Furthermore, based on the analysis of variance of repeated observations, the interaction between group and time was significant, which shows a different trend in the qualification score of nurses in the two groups during the study ( $P < 0.001$ ) [Figure 1].

## Discussion

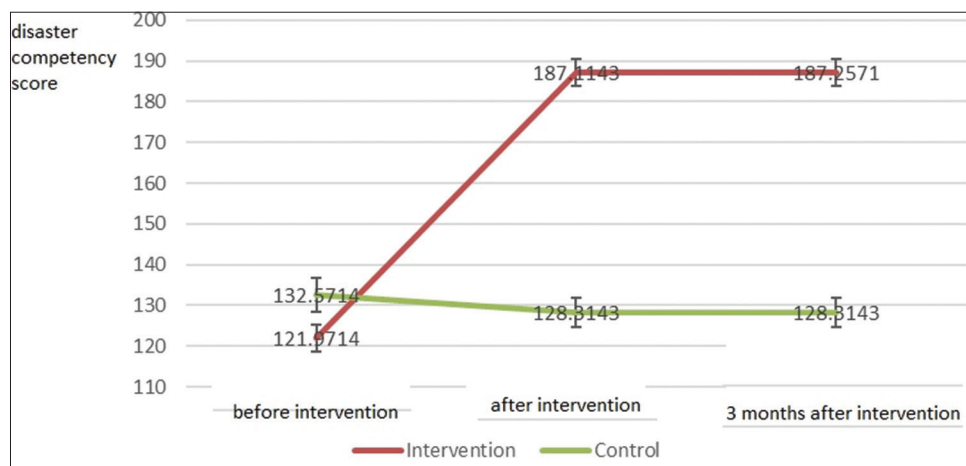
The aim of this study was to determine the "effect of operational exercise on nurses' competence in dealing with disaster." Regarding demographic variables, the mean and standard deviation of age and work experience of nurses in this study were  $33.45 \pm 6.22$  years and  $11.7 \pm 4.23$ , respectively. The results of similar studies in this field indicate age similarity to the current study which indicates the young age of the nursing community and the need for more specialized training to increase the experience and ability of this group to provide specialized care in disasters.<sup>[28,29]</sup>

Furthermore, 48.4% of the control group had a history of participating in disaster-related training courses, 34.3% had a history of participating in training maneuvers, and 11.4% had a history of participating in disasters. In the intervention group, 48.6% had a history of participating in training courses. Nearly 28% had a history of participating in training maneuvers and 17.1%

**Table 1: Comparison of demographic characteristic of sample in two groups**

Variable	Control group	Intervention group	P
Age, mean±SD	32.45±6.22	34.00±6.37	0.72
Working experience (years), mean±SD	8.80±4.56	9.17±5.38	0.75
Characteristics	Control group, n (%)	Intervention group, n (%)	P
Sex			
Male	13 (37.1)	3 (8.6)	0.004
Female	22 (62.9)	32 (91.4)	
Marital status			
Single	12 (34.3)	10 (28.6)	0.61
Married	23 (65.7)	25 (71.4)	
Education level			
Bachelor	34 (97.1)	35 (100)	0.32
Master	1 (2.9)	0	
Work area			
Emergency	19 (54.3)	17 (48.6)	0.65
Internal medicine	16 (45.7)	18 (51.4)	
Participation in disaster education			
Yes	17 (48.6)	17 (48.6)	0.1
No	18 (51.4)	18 (51.4)	
History of participating in the maneuvers			
Yes	12 (43.3)	10 (28.6)	0.61
No	23 (56.7)	25 (71.4)	
History of participating in disaster			
Yes	4 (11.4)	6 (17.1)	0.50
No	31 (88.6)	29 (82.9)	

SD=Standard deviation



**Figure 1:** Changes in nurses' professional competency scores during the study in two groups

had a history of participating in disasters. However, in studies conducted in other countries, the participation rate of participants in disaster-related training courses has been more than 50%.<sup>[30]</sup>

Furthermore, in some previous studies in developed countries, such as the Arbon study in Australia, a high percentage of nurses who volunteer to provide disaster care (80%) lack previous experience in providing care in disaster situations. The authors suggest that nurses working in the hospital's emergency wards can play an important role in disaster nursing and perform measures

such as triage and initiating life-saving interventions. Nurses with insufficient experience in this field are not able to act effectively in critical situations, which is in line with the results of a recent study.<sup>[31]</sup>

The findings of the present study showed that, in the control group before the intervention, the standard deviation of nurses' competency score was  $132.57 \pm 24.64$ , and in the intervention, group was  $121.97 \pm 19.95$ , and there was no statistically significant difference between the two groups ( $P = 0.052$ ). While immediately after the intervention and 3 months

**Table 2: Comparison of mean competence of nurses in two groups**

Variable	Stage	Mean±SD		P
		Control group	Intervention group	
Nurse competency	Before intervention	132.57±24.64	121.97±19.95	0.052
	Immediately after intervention	128.31±21.32	187.11±19.72	<0.001
	3 months after intervention	128.31±21.35	187.25±19.72	<0.001
P value between groups		<0.01	<0.001	
Changes in the time		-4.25±5.13	65.28±3.38	<0.001

SD=Standard deviation

after the intervention, the competency score in the intervention group was significantly higher than the control group ( $P < 0.001$ ).

In this regard, a descriptive and analytical study by Ghaedamini *et al.* in 2019 entitled "Determining the relationship between emotional intelligence and decision-making style of nurses in response to disasters indicate that the nurse competency are moderate and the implementation of training programs to strengthen these competencies is effective,"<sup>[26]</sup> which is consistent with the results of the present study.

Furthermore, the results of a study Rahimkhanli *et al.* entitled "Evaluation of clinical skills of emergency medical staff in Jahrom in caring for trauma victims" in 2018 showed that 62% of trauma staff had good skills. However, in the two skills of using traction splint and oral-tracheal intubation, they had major skills deficits that also scored poorly.<sup>[32]</sup>

In this regard, the results of the study of Kumar *et al.*, which examined the knowledge, attitude, and practice of three groups of health-care providers in the field of prehospital and emergency care showed that the average performance score of research units in prehospital and emergency care was less than moderate.<sup>[33]</sup> All of these results are in line with the results of a recent study indicate the undesirable level of nurses' readiness and the need to implement educational interventions to improve their ability.

Furthermore, in a 2019 study by Huh and Kang in South Korea, on sixty nursing students evaluating the "impact of a training program on disaster nursing competencies" based on the framework of training activities for nursing at each stage of disasters (prevention, Response, improvement, and rehabilitation) and using the method of learning based on combined principles (theory and practice) strengthened and increased students' interest in participating in this program, which the results of this study indicated that the training program and empowerment increase nursing student competence.<sup>[24]</sup> Other studies in this field have shown the effectiveness of periodic maneuvers in improving the overall competence of nurses. Among

them, Nejadshafiee in Kerman in 2019 conducted a study entitled "Professional competence of nurses in disasters," in which the results showed that nurses' participation in maneuvers has the greatest impact on the professional competence of nurses in disasters and participants in maneuvers have higher scores than people who had no experience which is consistent with the present study.<sup>[34]</sup>

Explaining this finding, it can be said that the ability of nurses can affect nursing competence. This means that, by increasing the ability of nurses, defects and shortcomings in their work can be reduced and prepare them to be in disaster situations. Nurses' abilities can also be greatly enhanced by holding workshops and table top maneuvers. Therefore, in line with the results of the recent study, the use of simulation methods can be used as new and effective approaches in the field of education.

However, in a study conducted by Amerioun *et al.* in Tehran in 2015 entitled "Study of the effect of training program and trauma maneuver on staff training in selected military hospitals," the results showed that implementation of the trauma maneuver preparedness program has not had a significant effect on increasing the readiness of hospital staff to respond to possible disasters, the results are in contrast with the present study.<sup>[35]</sup>

Furthermore, in a study conducted by Nakhaei *et al.* in Mashhad entitled "The effect of educational intervention on nurses' preparedness in disasters," the results showed that the average score of psychological readiness do not increase after the intervention. The mean score of readiness was assessed in the poor level. This decrease in mental readiness score is probably due to the fact that, with the increase of nurses' preparedness in the face of disasters, their expectations increase, which are not in line with the reality of the environment and contradict the present study.<sup>[29]</sup>

### Limitation and recommendation

According to the results of the recent study and related research in this field, holding maneuvers, operational exercise, and in-service training courses can be effective in empowering nurses in the face of disasters. Consequently, these interventions on

crisis and disaster management are necessary. The nurses are also recommended to participate in these programs to increase their readiness. Thus, future study courses should be presented for more days and hours. Furthermore, more discussions for various scenarios in tabletop exercise should be offered in future studies.

## Conclusion

The results of the present study showed an increase in nurses' competence in dealing with the disaster and related areas in the discussion of managerial, ethical, specific individual, and specialized competencies in the intervention group compared to the control group. Therefore, considering the emphasis on in-service training and its effectiveness in discussing staff competence, the present results can be practical confirmation of this issue. Tabletop method and operational exercise due to having a scenario and the greater participation of nurses in the learning process have more effective than lecturing education. This finding highlights the positive effect of participants' interactions in the tabletop and operational exercise method on the quality of education, critical skills, and the increased level of nurses' competency against disasters.

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## Conflicts of interest

There are no conflicts of interest.

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