The effect of Tabletop Exercise on the degree of improvement of the preparedness of selected military hospitals in mass casualty incidents

Abstract

Introduction: Hospitals are the first centers that are affected by accidents and disasters. Formulating a preparedness plan, taking into account the training of all employees and regular exercises, along with the forecasting of the required resources, is one of the necessities of disaster management response. The present study was conducted to investigate the effectiveness of disaster management training based on the Tabletop Exercises approach on the ability of members of the hospital incident command system to deal with mass casualties in one of the selected military hospitals in Tehran.

Methodology: This research is a semi-experimental study that was conducted on a group before and after. The statistical population of the research was the members of the Hospital Incident Command System (HICS), and a total of 20 people were selected and included in the study based on the entry criteria. The data collection tool was a Questionnaire prepared by the researcher to measure the readiness of the hospital regarding the incident command system, excess capacity, and early warning system.

Findings: the average total score of preparation before the intervention out of 10 scores was 6.47±0.87 and the average total score of their ability and attitude in Dealing with disasters before intervention was 3.19 ± 0.72 and 3.28 ± 0.41 out of 5 scores. The average score of readiness in general and in the area of competence in nurses immediately and one month after the intervention compared to before and the average score of attitude one month after the intervention increased significantly compared to before. After completing the course in the simulated environment in the workshop, 100% of the students' scores were at a good level. Also, in the field of acquiring pre-hospital skills, the scores of 100% of students were at the proficient level. In addition, after the end of the training workshop, 100% of the students evaluated themselves at a completely proficient level.

Conclusion: The educational intervention had a significant effect on increasing the members of the incident command system and the hospital in dealing with disasters; Therefore, to improve the preparation of the medical staff, it is suggested that the hospital managers hold training courses with both table and operational exercises.

Keywords: mass casualty; tabletop exercises; disasters; education; preparedness; response

Introduction

In recent decades, major accidents and disasters have been increasing in the whole world and Iran. The occurrence of these incidents affects more people every day, disrupts the provision of health services, and slows down the development process [1, 2]. In accidents with mass casualties, in addition to the injury of a large number of people in the affected society, it will also result in physical, mental, and social disability[3, 4]. Accidents with mass casualties are accidents that hospital emergency service resources, including staff, and equipment, cannot respond to because of the number and severity of injuries [5]. Due to the high demand for providing health services during accidents and disasters, having a plan to prepare and respond to such accidents is one of the necessities of hospital risk management [6, 7]. Developing a preparedness plan, taking into account the training of all employees and regular exercises along with forecasting the required resources, is one of the necessities of incident management response [8]. Capacity building in hospitals as the most important set of providers of health services in accidents and disasters related to accidents that have a large number of injuries is one of the priorities of the health system [9]. Health sector employees are the first group to respond to accidents and disasters with mass casualties, hence their level of preparation and proportional response is an important factor determining the rate of death and possible injuries in the events [10, 11]. exercise is practical learning and a suitable method for checking and improving personnel performance in simulated conditions based on different scenarios. exercise is a factor to empower personnel in analyzing information and decision-making power [12, 13] The exercise is done with different goals, including training the personnel or increasing the capabilities and individual skills of the personnel, specifying the weak points and needs. There are different categories for types of exercises, in one of the most common methods, exercises are divided into two types based on discussion and based on performance [14]. Performance-based training means a kind of

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training combined with practical work. This exercise is held to evaluate plans, policies, memorandums, and procedures, clarify roles and responsibilities, and identify the lack of resources in an operational environment. Performance-based training includes three types of exercises, functional training and full-scale training[14, 15]. Unfortunately, recent studies show that healthcare workers are not well prepared to respond to accidents. Various studies have been conducted in the field of investigating the effect of discussion-based exercises, including round table exercises in mass casualty incidents. Abbasi Dolatabadi et al, have introduced the lack of knowledge and lack of preparation as a factor for creating emotional pressures during the implementation of their duties in crisis and disaster situations and believe that the preparedness to respond to disasters in healthcare workers increases their self-confidence and reduces the number of damages and Vulnerability in dealing with unforeseen events [16]. Khankeh et al, have introduced the trained workforce as one of the facilitating factors in providing health services [17, 18]. Kang J et al reported that the training of healthcare workers has long been recognized as a major component of disaster preparedness [19]. Experiences also show that health workers are not only not well prepared to respond to incidents, but inconsistencies and parallel or conflicting actions have worsened the situation, which indicates a gap in the methods for crises. The scientific review of past experiences shows that the main weakness of crisis management in hospitals is the intra-organizational inconsistency and inconsistency between the main responders depending on the type and severity of incidents in disasters. One of the important challenges is the lack of familiarity of healthcare workers in the field of crisis management with team functions. Unfortunately, most functions occur in the form of "islands" and are ineffective or with a large number of responsible and incident commanders. Previous experiences have shown that holding training and various exercises in the field of coordination and team performance, especially among the members of the incident command system in the hospital, has led to better outcomes in crisis management[17, 19]. Achieving coordination and coherence between the different members of the incident command system involved in incidents requires a foundation, one of the important foundations of which is team training, exercises, and coordination. This is even though, unfortunately, the dominant approach of training for groups involved in accidents is single-professional approaches, which not only does not prepare them for team performance but also leads to the creation of an individualistic spirit in them. Jose et al, in a consolidated review study, investigated the most effective methods or educational approaches to increase the ability of healthcare workers to respond to a crisis, their findings by reviewing more than 190 primary studies showed that the best educational approach in this regard is holding round table exercises and It is a simulation. To provide an effective, coordinated, and organized response to the effects of various types of disasters and emergencies, the existence of emergency operation plans (EOP) is very necessary [20]. But it should be kept in mind that this program should not only exist theoretically but should be validated in a written form in the form of holding different types of exercises. Exercises are activities that are carried out with the purpose of training and training ability. Since the selected military hospital is located in a strategic area of Tehran and the preparedness to respond to accidents and disasters is of particular importance in this area, therefore, the present study aims to investigate the effectiveness of training on accident and disaster management based on the practice approach. The ability of hospital incident command system members to deal with mass casualties was carried out in selected military hospitals in Tehran.

Method:

Study Design

The current research was a semi-experimental study of one group before and after with the table-top exercise scenario of incidents with mass casualties. The statistical population includes the members of the HICS incident command system of the hospital.

Study Sitting and Sample

The community includes the directorate, senior and middle managers, doctors, nurses, and health and emergency managers, and a total of 20 members of the system were included in the study.

Table 1- Statistical population of the research

NO	job title	Level of education	Activity history (years)
1	Hospital Manager	Master of Hospital Management	23
2	Health Manager / Support Manager	Bachelor of Environmental Health	26
3	Health expert	Bachelor of Professional Health	21

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4	Nursing manager	Master of Nursing	25
5	Emergency manager	nursing expert	12
6	Nursing supervisor	nursing expert	24
7	Nursing supervisor	nursing expert	23
8	Nursing supervisor	nursing expert	26
9	Nursing supervisor	nursing expert	26
10	Infection control supervisor	nursing expert	18
11	Educational supervisor	Master of Nursing	24
12	engineering manager	Master of Civil Engineering	19
13	General practitioner	a professional doctor	20
14	General practitioner	a professional doctor	22
15	Director of Treatment Assistance services	Bachelor of Physiotherapy	28
16	Laboratory Manager	Bachelor of Laboratory Science	25
17	Director of Public Relations	Bachelor of Public Relations	5
18	HSE manager	Management Expert	29
19	Responsible for physical protection	HSE Associate	13

Study Instrument

Data collection was done by a researcher-made questionnaire, which content and face validity was done by 10 experts. The questionnaire was to measure the components of the hospital's readiness regarding the incident command system, overcapacity and early warning system.

Table 2- Demographic information of experts and specialists in the content validity of the questionnaire

NO	job title	Level of education	Activity history (years)
1	University faculty member and crisis manager	PhD in Nursing	33
2	University faculty member	Ph.D. in disaster health	29
3	Hospital accreditation consultant	Ph.D. in disaster health	20
4	Emergency doctor	Doctorate in emergency medicine	31
5	Medical equipment manager	PhD in medical engineering	25
6	crisis manager	Senior HSE expert	28
7	General physician (responsible for passive defense and crisis management)	PHD	35
8	Health expert	Health expert	22
9	Emergency manager	Senior expert in emergency nursing	15
10	crisis manager	Senior expert in crisis management	15

Data Collection

After confirming the news of the accident and announcing the crisis code, the members of the hospital's incident command system were called to the hospital's command center by the commander. During the round table exercise, the task description was asked from each of the process owners participating in the research. At the end of the round table exercise, the weaknesses and strengths and the effectiveness of the given trainings were discussed with interaction, mutual thinking and rethinking.

Statistical Analysis

The members of the hospital incident command system to participate in the training workshop, including the presentation of the theoretical foundations of crisis management, the hospital incident command system, along with the description of duties and defining the roles of the members defined in the HICS system, in order to implement the round table exercise, first by announcing the news of sending the injured to the news center Hospital incidents As the emergency operations center of the University of Medical Sciences (EOC), the center was informed of the incident according to the prepared scenario. The intervention was held in the form of holding two two-day (4-hour) training workshops on accident and disaster risk management by presenting the basics of the hospital incident command system and the practical part of the scenario-based round table exercise with the presence of the process owners. The data before and

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after the intervention were completed by the evaluator with a standard questionnaire to assess readiness and before and after the round table exercise.

Diagram 1- Flowchart of work execution method

Results:

Since preparedness and response play a major and vital role in hospitals' response to accidents and disasters. Therefore, in this study, the components of the early warning system, the incident command system, overcapacity and operational plans were examined in 2 dimensions of preparation and response before and after the round table exercise. Based on the results obtained from the present study, despite the effect of desk training and training on the readiness of members of the hospital's incident command system to deal with incidents with mass casualties in general, the average percentage of readiness and response before the intervention was 44.5% and 11.5%, respectively. It was 36%, and after the intervention of desk training, the percentage of readiness increased to 77.5% and the percentage of the hospital's response score increased to 72.22%. (Table 3,4).

Table 3- Preparation scores before the round table exercise

	NO	Activity	under review (0)	in progress (1)	Terminated (2)
preparation	1	Has the early warning system been designed and compiled?		1	
	2	Is there a hospital incident command system?		1	
	3	Is there a plan to activate the hospital's incident command system?		1	
	4	Is there a hospital control room (HCC) activation program?		1	
	5	Has the system activation plan been developed based on the severity of the incident?		1	
	6	Has the hospital response program to mass casualty incidents been activated?		1	
	7	Has the hospital's response plan to mass casualty incidents been compiled?		1	
	8	Has a plan been developed regarding the employment of specialized human resources in the hospital?		1	
	9	Is there a plan for calling volunteers?		1	
	10	Is there a plan regarding the physical space (patient triage)?			2
	11	Are there plans for the physical space (temporary cold storage)?		1	
	12	Has a plan been developed regarding drugs and (medical) equipment?		1	
	13	Is there a plan for support (vehicles)?			
	14	Has a plan been developed regarding the processes (contracting with other centers)?			

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	15	Has a plan been developed regarding the processes (emergency evacuation)?		1	
	16	Regarding the processes (immediate response 0-2 hours), have plans been developed?			
	17	Regarding the processes (immediate response 12-2 hours) have plans been developed?		1	
	18	Regarding the processes (immediate response of more than 12 hours), has a plan been developed?			2
Response	1	Was the early warning system activated?	0		
	2	Has the hospital's incident command system been activated?		1	
	3	Was the hospital's incident command system operational?		1	
	4	Has the Hospital Command Center (HCC) been activated?		1	
	5	Was the system activation plan implemented based on the severity of the incident?		1	
	6	Has the hospital response plan to incidents with mass casualties been operational?		1	
	7	Has the hospital response plan to mass casualty incidents been implemented?		1	
	8	Has the program to employ specialist human resources of the hospital been implemented?		1	
	9	Has the operational plan for calling volunteers been implemented?	0		
	10	Has the operational plan of the physical space (patient triage) been implemented?		1	
	11	Has the operational plan of the physical space (temporary cold storage) been implemented?		1	
	12	Was the drug and equipment (medical) operational plan implemented?		1	
	13	Has the operational support plan (vehicles) been implemented?	0		
	14	Were the organizations that agreed with the hospital activated during the crisis?	0		
	15	Has a plan been developed regarding the processes (emergency evacuation)?		1	
	16	Regarding the processes (immediate response 0-2 hours), have plans been developed?		1	
	17	Regarding the processes (immediate response 12-2 hours) have plans been developed?		1	
	18	Regarding the processes (immediate response of more than 12 hours), has a plan been developed?	0		

Table 4- Preparation scores after round table practice

	NO	Activity	under review (0)	in progress (1)	Terminated (2)
preparation	1	Has the early warning system been designed and compiled?			2
	2	Is there a hospital incident command system?			2
	3	Is there a plan to activate the hospital's incident command system?			2
	4	Is there a hospital control room (HCC) activation program?			2
	5	Has the system activation plan been developed based on the severity of the incident?		1	

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	6	Has the hospital response program to mass casualty incidents been activated?		1	
	7	Has the hospital's response plan to mass casualty incidents been compiled?			2
	8	Has a plan been developed regarding the employment of specialized human resources in the hospital?		1	
	9	Is there a plan for calling volunteers?		1	
	10	Is there a plan regarding the physical space (patient triage)?			2
	11	Are there plans for the physical space (temporary cold storage)?			2
	12	Has a plan been developed regarding drugs and (medical) equipment?		1	
	13	Is there a plan for support (vehicles)?		1	
	14	Has a plan been developed regarding the processes (contracting with other centers)?		1	
	15	Has a plan been developed regarding the processes (emergency evacuation)?			2
	16	Regarding the processes (immediate response 0-2 hours), have plans been developed?		1	
	17	Regarding the processes (immediate response 12-2 hours) have plans been developed?			2
	18	Regarding the processes (immediate response of more than 12 hours), has a plan been developed?			2
Response	1	Was the early warning system activated?		1	
	2	Has the hospital's incident command system been activated?			2
	3	Was the hospital's incident command system operational?		1	
	4	Has the Hospital Command Center (HCC) been activated?			2
	5	Was the system activation plan implemented based on the severity of the incident?		1	
	6	Has the hospital response plan to incidents with mass casualties been operational?		1	
	7	Has the hospital response plan to mass casualty incidents been implemented?			2
	8	Has the program to employ specialist human resources of the hospital been implemented?		1	
	9	Has the operational plan for calling volunteers been implemented?		1	
	10	Has the operational plan of the physical space (patient triage) been implemented?			2
	11	Has the operational plan of the physical space (temporary cold storage) been implemented?			2
	12	Was the drug and equipment (medical) operational plan implemented?		1	
	13	Has the operational support plan (vehicles) been implemented?			2
	14	Were the organizations that agreed with the hospital activated during the crisis?		1	
	15	Has a plan been developed regarding the processes (emergency evacuation)?		1	
	16	Regarding the processes (immediate response 0-2 hours), have plans been developed?			2
	17	Regarding the processes (immediate response 12-2 hours) have plans been developed?			2

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	18	Regarding the processes (immediate response of more than 12 hours), has a plan been developed?		1	

In total, the hospital has improved by 33% in the readiness index and 36.11% in the response index. It seems that the round table exercise can be effective in improving the preparedness of the hospital in the face of accidents and disasters (Chart 1).

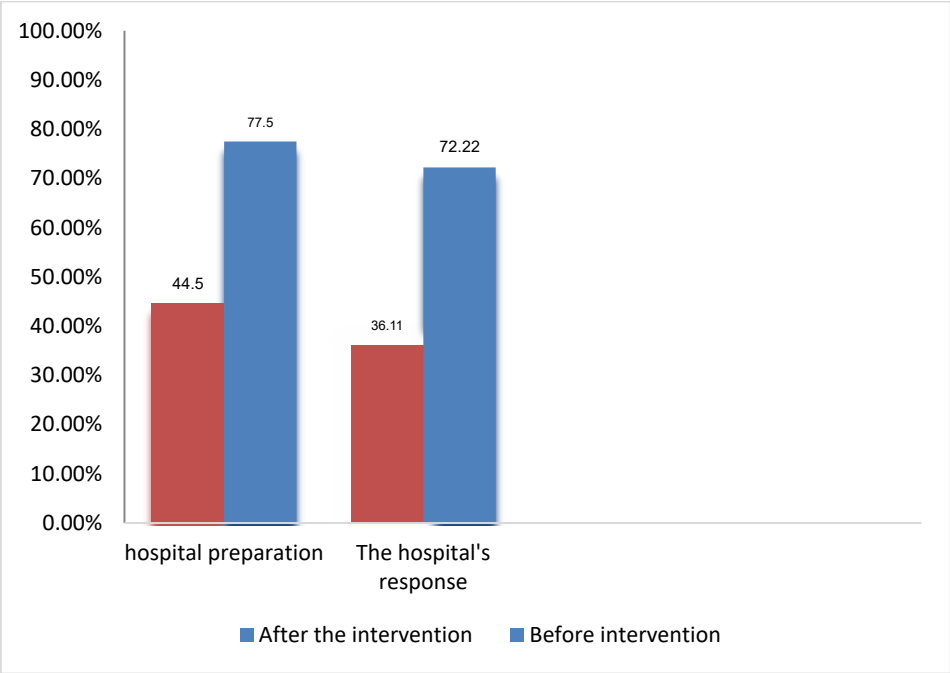

Diagram 1- Comparing the hospital's readiness and response percentage before and after the intervention

Discuss:

This study was designed to determine the effect of educational intervention and holding table exercises on the preparedness of healthcare workers of a selected military hospital in Tehran to deal with incidents with mass casualties. According to the results obtained from the present study, about half of the healthcare workers (48%) had faced crises and disasters, and (65.3%) of nurses reported that they were trained in dealing with disasters, but most of them (92%) needed to They felt the training in themselves, which could be because the training provided were not effective and sufficient, or they were not provided at the right time. In the study by Jen Heng Pek et al, on the topic Use of Simulation in Full-Scale Exercises for Response to Disasters and Mass-Casualty Incidents: A Scoping Review, which was conducted in 2023, evaluation outcomes across the full-scale exercises were varied, leading to the inability to consolidate effectiveness of simulation into a single measure. It is recommended for best evidence-based practices for simulation to be adhered to in full-scale exercises so that the training could translate into better outcomes for casualties during an actual disaster or mass-casualty incident. In addition, the reporting of simulation use in full-scale exercises should be standardized using a framework, and the evaluation process should be rigorous so that effectiveness can be determined and compared across full-scale exercises[21, 22]. In the study by Hamad Al-Romaihi et al, on the topic Knowledge, Attitude, and Training of Health-Care Workers and Preparedness of Hospital Emergency Departments for the Threat of Communicable Diseases at Mass Gathering Events in Qatar: A Cross-Sectional Study which was conducted in 2023, evaluation outcomes The overall mean knowledge score about CD threat among study participants was 75.0% (SD ± 18.1). The majority of the participants had a favorable attitude toward CD preparedness during MG events. The participants achieved high scores in attending workshops on triaging, first aid, and infection control. Study participants also had favorable perceptions about the current preparedness of their respective hospitals to respond to CD outbreaks in MG events[23, 24]. In the study by Teng-Calleja M et al, on the topic Dissecting HR's role in disaster preparedness and response: a phenomenological approach which was conducted in 2023, The results showed that the overall score in the areas of knowledge, attitude, and performance increased significantly after the intervention compared to before[۲۶ ,۲۵]. In the study by Xia R et al, on the topic of evaluating the effectiveness of a disaster preparedness nursing education program in Chengdu, China. Public Health nursing which was conducted in 2020, evaluation

outcomes Students receiving the program displayed greater increases in knowledge and skills related to disaster preparedness than those in the control group. One month after the intervention, the experimental group still had significantly higher levels of disaster knowledge and skill than the control group. There were no statistically significant differences over time in attitude measures. This program enhanced students' ability and the findings can serve as a basis for further developing public health education for all nurses. Chinese leaders of public health institutions and nursing administrators can create guidelines for PHN competencies and prepare the public health nursing workforce to be effective in disaster, preparedness, response, and recovery[27]. In the study by Nejadshafiee M et al, on the topic Necessity for learning the knowledge and skills required for nurses in a disaster which was conducted in 2016, The results showed that the majority of experts (76%) assessed the necessity of training and creating the necessary capabilities in nurses in the field of accidents and disasters and caring for the injured as "very high" and (23.53%) as "very high"[28]. In the study by Mulyasari F et al, on the topic Disaster preparedness: looking through the lens of hospitals in Japan which was conducted in 2013, evaluation outcomes The level of health care in dealing with disasters is reported to be average[29]. In the study by Fung OW et al, on the topic of Disaster preparedness among Hong Kong nurses which was conducted in 2008, evaluation outcomes Nurses in Hong Kong are not adequately prepared for disasters but are aware of the need for such preparation. Disaster management training should be included in the basic education of nurses[30, 31]. Training programs for dealing with disasters will increase the awareness of hospital personnel about the existing plans for dealing with disasters increase the participation of employees in the matter of planning and solving the problems of existing programs, and also increase the skills of employees in performing the tasks assigned to them [24]. Therefore, training and practice are done as an effective way to prepare personnel to respond to disasters and prepare to face disasters and unexpected events [25, 26].

Skryabina et al. (2020) studied the role of emergency preparedness exercises in response to a mass casualty terrorist incident: a mixed methods study. The results show that the main advantage of participating in the exercise and how to respond to an incident, considering the rarity of major incidents with mass casualties, simulation exercises are the only option for testing major incident programs, in order to keep them up-to-date in response to these incidents by Skills and knowledge to improve response coordination through adherence to practiced incident plans. People's confidence when answering[32].

Moss et al. (2021) in a study entitled Training for mass casualty preparedness, the results show that training is also likely to increase the self-confidence of employees and make them feel more prepared. Practice should be tailored to the needs and potential challenges of each health care system[33].

Ugelvik et al. (2023) in a study entitled Assessing Prehospital Preparedness for Major Incidents at the National Level, Focusing on Mass Casualty Incidents This study found significant gaps between prehospital rescue and emergency services in Norway regarding preparedness work. It indicates the need for national standards, minimum requirements, follow-up procedures for organizations and future re-evaluations. The implementation of mandatory interdisciplinary training between fire/rescue, police and emergency ambulance services appears to have helped. Regular reviews of the standard can be a useful tool for evaluating and tracking mass casualty preparedness at the national, regional, and local levels[34].

In a study, Schulz et al. (2024) investigated first medical responders' perceptions of mass casualty scenario training: a qualitative study of learning conditions and recommendations for improvement. Support for realistic scenarios, inter-agency collaboration, improved incident management skills, and thorough post-training evaluation were identified. Also, using the potential of virtual reality technologies as a valuable technology for training is a great help in training[35].

Cocco et al. (2019) in a research titled Preparedness planning and response to a mass casualty incident: a case study of the Health Sciences Center showed that the lessons obtained from the preparedness assessment are closely related to the lessons related to the actual incident and the importance of preparedness assessments. It has an important role, and exercises of any kind can play an effective role in identifying and improving opportunities, increasing preparation. Mitigating interoperability issues in an emergency requires investment in training, planning and preparedness, as well as routine mass casualty incident training and exercises, involving affected departments and services throughout the hospital environment. In addition, including the principles of managing capacity increase in hospital emergency plans is one of the things that is needed to maintain the continuity of health center operations during a crisis[36].

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Veenema, et al. (2018) with a study titled Analysis of Emergency Health Care Workforce and Service Preparedness for a Mass Casualty Event in the Republic of Ireland showed that the level of knowledge and confidence in different disciplines, in general, nurses reported the least knowledge. indicated that there are serious deficiencies in HCP knowledge, skills and self-perceived abilities to participate in a large-scale mass casualty event[37].

Ashkenazi et al. (2012) in a research entitled evaluation of hospital disaster plans for conventional mass casualty events following terrorist explosions using live practice based on real patient data. Conducting the exercise helps identify deficiencies in the hospital's disaster plan in triage, emergency department management, and appropriate use of resources such as radiology, operating rooms, and secondary patient transport. Having previous knowledge about disease diagnosis, identifying problems and statistics of deficiencies and specifying resources allows us to have a correct identification in clinical decision-making and use of resources and management[38].

Conclusion:

According to the results of the present study, accident, and disaster managers must carry out training courses in this field continuously and in the form of limited operational exercises to improve the readiness of members of the incident command system and hospital staff and to respond effectively to accidents with mass casualties.

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Authors' contributions

Alireza Basiri (First Author), Introduction Writer/Main Researcher (30%); Mohsen Abbasi Farajzadeh (Second Author), Methodologist/Statistical Analyst (25%); Mohammad Mohammadian (Third author), Discussion Writer/Data Analyst (10%); Esmail Heidaranlu (Fourth Author), Correspond Researcher/Discussion Writer (35%)

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Availability of data and materials

The datasets used in the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The present article is taken from the approved research project 402000006 at Baqiyatullah University of Medical Sciences with ethics ID IR.BMSU.REC.1402.069. This study was conducted in 2023 this article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all participants participating in the study. The confidentiality and anonymity of the participants were determined by coding the questionnaires. Study participants were informed of their freedom to withdraw from the study at any time without giving a reason.

Consent for publication

Not applicable

Competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

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