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Identifying and Explaining the Components Affecting for Design Preparedness Exercises of the Health System in Emergencies and Disasters: A Quality Content Analysis

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Abstract

Objective: Running exercise courses in different sectors of the health system is one of the important steps to prepare and deploy disaster risk management programs. The present study aimed to identify and explain the components affecting the design of preparedness exercises of the health system in disasters.

Methods: This study was a qualitative content analysis. Data were collected by purposeful sampling through in-depth and semi-structured individual interviews with 25 health professionals in disasters who had experience in designing, implementing, and evaluating an exercise. The data were analyzed using the content analysis method.

Results: The data analysis resulted in the production of 50 initial codes, 12 subcategories, 4 main categories of “Coordination, Command, and Guidance of Exercise,” “Hardware and Software Requirements of Exercise,” “Organizational Exercise Resources,” and “Communication and Exercise Public Information” with the original theme of “Exercise Design.”

Conclusion: This study provides a clear picture and rich, constructive information on the concept of designing health system preparedness exercises in disasters. The findings of this study can greatly increase the attention of senior managers in all areas of health, especially managers of pre-hospitals and hospitals who are in the front line of the response to disasters to design standard and scientific preparedness exercises.

Natural and man-made disasters have always threatened human societies and have been the source of many casualties and financial losses.^{1,2} The World Health Organization considers disasters as occurrences disrupting the normal conditions of a society, resulting in widespread damage of humans, economy, or environment that exceeds the capacity of adjustment of the affected society.^{3,4} Preparedness is defined as knowledge, capabilities, and actions of governments, organizations, social groups and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current hazard events or conditions.^{5–7} Among several components of disaster management, the health centers and affiliated units can reduce physical, financial, and social damage due to disasters by providing the preparedness plans and appropriate strategies.^{8–10} Soji Nika et al. have concluded in their study that disaster management and its consequences are now essential for maintaining communities and stability, and that the health sector has a special place among all the elements involved in disaster management because people’s first and foremost demand and concern is health.¹¹

Disaster exercises are one of the important steps in developing and implementing disaster risk management programs in different areas of the health system.¹² Exercises simulate the realistic conditions so that people improve their mental and physical skills in situations similar to real conditions and provide an appropriate response based on existing programs to emergencies and disasters.¹³ Skrabina et al. found that operational exercises were activities aimed at training and practicing empowerment and identifying core competencies in preventing and mitigating effects, reducing vulnerability, responding, and rehabilitating in a risk-free environment for participants.¹² Disaster exercises can be used to test and validate policies, programs, procedures, as well as train personnel roles and responsibilities, improve individual performance, and improve interorganizational communication and coordination.¹⁴ For designing an exercise, an organization should first conduct a needs assessment to assist in defining the problems, establishing the need for the exercise, and identifying the functions that need to be exercised.¹³ Also, disaster

researchers declared that evaluation indicators of an exercise should be selected during the design phase of the exercise.^{1,15,16}

The health system resources are annually used for disaster preparedness exercises, but due to the lack of well-designed programs and guidelines for these exercises, macro goals and outlined prospects in the field of health system preparedness for disasters have not been achieved or they do not have capabilities and necessary scientific measurement. Therefore, considering the importance of promoting health system preparedness through exercise, the present study aimed at identifying and explaining the components affecting the design of preparedness exercises of the health system in disasters. The findings of this study can be considered a guideline for the design of principled and standardized health preparedness exercises for a timely response to disasters.

Methods

Study Design

This qualitative study was done by a directed content analysis approach in 2019. Content analysis is a method that can be used with either qualitative or quantitative data and in an inductive or deductive way. This approach is useful when an existing theory or research literature on a phenomenon is limited.^{17,18} In this study, we used a deductive approach to achieve the objectives of the study.

Setting, Participants, and Data Collection

This qualitative study was conducted in Iran, one of the most disaster-prone countries in the world. Study population included 25 experts in disasters, who had practical experience or theoretical knowledge about “designing of preparedness exercises in disasters” and had been present at least once in operation-based or discussion-based exercises. Participants were chosen using a purposeful sampling method with maximum diversity. Sampling was carried out until data saturation occurred, that is, when the researcher concluded that further interviews would fail to provide new information. Participants included 7 prehospital directors, 4 hospital directors, 2 nursing experts in a hospital emergencies committee, 4 experts in Emergency Operation Centers (EOC) in the University of Medical Science, 6 health experts in disaster risk reduction, and 2 deputies of the logistic of the University of Medical Sciences.

In this study, Hojjat Sheikhbardsiri (HS) conducted the interviews face to face and individually. The process of data collection was under the supervision of Ali Sahebi (AS). The interviewees answered a similar set of questions, which included (1) Have you ever experienced the preparedness exercises of the health system in disasters? (2) Describe the worst and best disaster exercises that you have experienced in the health system. (3) Based on your experience, what components and features should be considered in a standard discussion-based exercise? (4) What components and features should be considered in a standard operation-based exercise? (5) What requirements and functions should be considered for the design of operation- and discussion- based exercises in disasters? Based on the above guide, additional questions were raised during the interview and when authors found new concepts. Moreover, *who*, *when*, *why*, and *how* were used for concept saturation as well as “Could you please give an example” or “Please explain more” for data and concept saturation. The interviews were taped and lasted 25-74 minutes. The place and time of the interview were selected by agreement between the interviewer and the interviewee, and field notes were written during interviews to describe and interpret the responses correctly.

Reliability and Validity

This study employed strategies recommended by Lincoln and Guba¹⁹ for reliability and validity tests. According to this recommendation, 4 criteria of credibility, dependency, conformability, and transferability are required to ensure reliability. Credibility was ensured through assignment of sufficient time for data collection and analysis, prolonged engagement with the participants, constant comparison of participants’ expressions, understanding of their experiences by the researcher, and maximum variety of the participants. Conformability was achieved by a member check, a peer check, and an expert check. The member check was done by returning the text of interview and summary of results to 4 participants for a confirmation of the findings. Two qualitative researchers in the research team (expert check and peer check) checked the validity of data collection and analysis process.

Ethical Consideration and Consent to Participate

The study was approved by the Ethics Committee of Kerman University of Medical Sciences with Reg. No. 40000883 and Ethic Code IR.KMU.REC.1400.714. Informed consent was obtained orally and in writing before the interview after explaining the aim and process of the study. In addition, participants were informed about the purpose of the study, the interview method, confidentiality of their information, and the right to withdraw from the study at any time.

Data Analysis

A qualitative content analysis was used to analyze the data. Systematic stages were followed and a simultaneous analysis was undertaken: First, recorded interviews were transcribed verbatim by the first author; then, prior to coding, the transcribed text was read several times for familiarization by the first, second, and third authors. In the initial coding process, the participants’ words were used and condensed meaning units were formed; then, the codes were categorized into subcategories based on their similarities and differences. This process continued for all interviews until the formation of the main categories by the first author.

Results

Demographic Information of Participants

The participants included 4 females and 21 males with a mean age of 42.25 ± 4.8 years ranging from 25 to 63 years. The mean duration of work experience was 15.5 ± 3.4 years, and all participants had more than 5 years of work experience in designing preparedness exercises of the health system in disasters (Table 1).

Main Results

An original theme of the exercise design, 4 main categories, 12 subcategories, and 50 codes were formed: coordination, command, and conduction of exercise (with 2 subcategories of intraorganizational and interorganizational coordination and design of an incident management system), exercise hardware and software requirements (with 4 subcategories of risk assessment, incident operational plan, consideration of documents, and lessons learned from past emergencies), organizational exercise resources (with 3 subcategories of selection of competent personnel, training personnel, and providing financial and logistic exercise resources), communication and general exercise information (with 3 subcategories

Table 1. Demographic characteristics of the participants in study on identifying and explaining the components affecting for design preparedness exercises health system in disasters in Iran

Categories	Number (25)	Percentage
Age		
25-35	5	20%
35-45	13	52%
Over 45	7	28%
Sex		
Male	21	84%
Female		
Experiences of design and performance of exercise		
5-15	18	72%
15-25	5	20%
Over 25	2	8%
Education level		
Bachelor's degree	12	48%
Master's degree	6	24%
General physician	4	16%
PhD	2	8%
Postdoctoral	1	4%

of providing exercise information resources, providing communications infrastructure, and cultural and social priorities) (Table 2). The main categories and subcategories are described in the following sections.

Main Theme

Design of Exercise

One of the most important steps to measure and improve health system preparedness in disasters is the standardized design of discussion-based and operation-based exercises to run comprehensive and long-term programs of the disaster risk management.

Main Categories and Subcategories

First Category: Coordination, Command, and Conduction of Exercise

The findings of the fieldwork indicate that coordination, command, and guidance play a crucial role in the design phase of the exercise.

Intraorganizational and interorganizational coordination

Interviewees believed that coordination before exercise, including the formal approval of top executives and the support of senior managers and organizational support, will play an important role in speeding up health preparedness for disasters through exercise. One of the best intraorganizational and interorganizational coordination solutions is to have a collaborative agreement for proper response to disasters:

Intra- and inter-organizational coordination when designing an exercise and the authorization of top executives to execute an important exercise are very important. For example, I as an expert wanted to do an exercise, which was scientific and very effective, but the security guard at the university prevented me and believed that it might cause a social seizure. (Participant 2)

Most importantly, we need to be aware of the response plans of other organizations and read them to prevent unexpected events. In addition, we should consult with organizations that have already conducted exercises; we need to see what goals they had. (Participant 7)

Design of an incident management system

From the experts' point of view, the University Incident Management System (UIMS), the Hospital Incident Command System (HICS), and Pre-Hospital System (PICS) are essential organizational structures to be fully prepared and respond effectively to an incident through exercise. Design, implementation, and evaluation of the exercise are also essential. The following are statements regarding the necessity for the organizational structure of the exercise in the Emergency Operational Plan (EOP):

If we are going to have a proper and meaningful exercise from the very beginning, we have to launch an exercise design system for universities similar to a pre-hospital incident command system or a hospital command system. (Participant 6)

Designing an incident management system in a physical location such as the University Emergency operations Center can play a managerial role in the disasters and also provides the necessary coordination for supply of the incident command needs. (Participant 9)

Second Category: Exercise Hardware and Software Requirements

One of the main categories of the present study is the provision of hardware and software requirements prior to the implementation of the main exercise.

Risk assessment

Interviewees believe that disaster risk assessment is the first step in disaster risk management, and it is very complex and time-consuming and requires multiple specialties, active involvement of all organizations, relevant people, consistent conscientious managers, and dedication of sufficient time and space:

Before designing any exercise, our incident center manager has to ask the experts in the operations management center to identify the main hazards using the Iranian hazards National Assessment Tool. (Participant 17)

A ready-made medical university is a university that first knows what it is ready for? What does it want to exercise for? Then it needs to know the hazards, to prioritize them, and identify their effects on its various sections. (Participant 3)

Providing an operational incident plan

From the interviewees' points of view, the purpose of designing the operational incident plan is to formulate a standardized, structured operational plan, with proper and accurate functions that must be available in all organizational units participating in the exercise:

In my opinion, the unclear key elements of an operational exercise plan, such as early warning system, command, timing and hazards analysis cause discoordination of the organizational units in the exercise, and we know that the world is trying to respond to disasters with minute planning and execution and they are more likely to reach their goal. (Participant 20)

One of the important things in the operational incident plan was the design of the exercise scenario. The experts of disasters argued that the exercise scenario was one of the most important elements of the exercise and that compiling and writing comprehensible, realistic, and rational scenarios was essential:

In my opinion, scenario is the infrastructure and basis of a good exercise and gives everyone a chance to test their response to the actual simulated incident,

Table 2. Categories and subcategories of components affecting the design of preparedness exercises of the health system in disasters

Theme	Category	Subcategory	Example of codes
Design preparedness exercises	Coordination, command, and conduction of exercise	<ul style="list-style-type: none"> - Intraorganizational and interorganizational coordination - Design of an incident management system 	<ul style="list-style-type: none"> - Having an official license from the authority highest in the organization. - Conduct necessary consultations with internal and external organizational units that have previous experience in performance of exercises. - Provide interorganizational and intraorganizational agreement with relevant disaster risk management units appropriate to the level of exercise. - Design incident command system for health units, including health, treatment, support, educational, (student) cultural, food, and drug. - Determining responsibility, successor, and job action sheets at different locations of the incident command system. - Design of the executive structure of the exercise appropriate to the position of the organization at the local, pole and national levels.
	Exercise hardware and software requirements	<ul style="list-style-type: none"> - Risk assessment - Incident operational plan - Consideration of national disaster risk management guidelines - Consideration of lessons learned of past incidences 	<ul style="list-style-type: none"> - Risk assessment and priority hazards identification using the risk assessment national tool. - Design a risk map for all hazards prioritized before implementation exercise. - Preparation of alert levels plan for priority hazards based on the national ranking plan. - Design of exercise scenario accurately based on priority hazards of organization. - Considering documents from the government, including the national plan of exercise in the Iranian health system at the time of design. - Design of exercise based on needs assessment, results in review, and lessons learned from area's previous incidents. - Scheduling and timing from the predesign phase to the modification and improvement of the response operational plan. - Performing discussion-based exercise (workshop, seminar, game, tabletop) before the desired operational exercise. - Equipping the centers (EOC, DOC), including communication equipment, physical space, human resources, and requirements in accordance with the Health Response Plan (HRP).
	Exercise organizational resources	<ul style="list-style-type: none"> - Selection of competent personnel - Training of exercise personnel - Providing exercise financial and logistic resources 	<ul style="list-style-type: none"> - Forecasting the budget and necessary financial resources to execute the different phases of exercise in the financial order of the organization. - Identify the members of the health rapid assessment team appropriate to the level of the incident in the scenario in terms of number and expertise. - Identify the exercise evaluation team and provide training on how to evaluate the exercise. - Identify controllers, facilitators, actors, role-makers, evaluators of exercise pre-implementation, and provide necessary training. - Select staff with the necessary physical and mental abilities, including motivation, seriousness, desire, and willingness to participate in the exercise.
	Communication and exercise general information	<ul style="list-style-type: none"> - Providing exercise information resources - Providing of communications infrastructure - Providing cultural and social priorities 	<ul style="list-style-type: none"> - Design an appropriate communication plan with different types of communication platforms and multilayers between different levels in the organization EOC. - Provide a comprehensive database, including telephone number, contact method, and address of residence of all persons participating in the exercise. - Participation of representatives of the local community, collaborative organizations, and logistics in the partial and overall design sessions of exercise. - Take into account cultural factors (including observance of Islamic dignity, language and culture of the community, and place of exercise). - Public information through the local media about the goals, process, and place of exercise to prevent intimidation, terror, rumor, and disorder in public order. - The planning necessary for the presence of prominent people at the right time at the exercise place to prevent disturbance of the order and flow of exercise.

even we can see our weaknesses and strengths and finally achieve our goal after the exercise. (Participant 11)

Consideration of national disaster risk management guidelines

The experts referring to upstream documentation and consulting with organizational units that previously have experienced successful exercises emphasized on designing the exercise:

Before designing the exercise, we need to study our upstream documentation well, so that the exercise has had no inconsistency or contradiction with the upstream documentation, there may be laws and regulations that approve the order or type of organization that should perform the exercise. However, exercise is not included; therefore, we must review the rules of the document. (Participant 9)

Consideration of lessons learned from past incidences

From the point of view of disaster specialists in Iran, lessons learned from past events are a valuable and important step to avoid repeating mistakes in disaster risk management, so we should know what resources were used in past exercises. Findings that we gained from past exercises could be headline organization upcoming exercises because past exercises will tell us the main problem of lack of preparedness and organization and poor response to disasters:

Most of the lessons learned are related to an incident happened previously and I think summarizing the results of a past exercise is very helpful, meaning what was done correctly and what could have done better. (Participant 22)

Third Category: Organizational Exercise Resources

Supplying the organizational exercise resources is very sensitive and important, and if managers do not pay special attention to it, the exercise will not be prepared and prevent the organization from achieving the anticipated development programs.

Selection of competent personnel

Selection of employees, one of the most valuable resources for the preparedness exercises in disasters, can play a significant role in advancing exercise and achieving predetermined goals, so employees should have the minimum qualifications needed to perform their role at the time of the exercise:

The physical and mental preparedness of the staff at various exercise sites is very important; for example, the rapid assessment team staff should have these physiological, physical abilities and important skills. (Participant 25)
In the hypothetical incident field, the controller and exercise evaluators must have complete physical and mental capabilities to evaluate all aspects of the exercise. (Participant 4)

It is very important that the staff of the organizational unit of exercise have the emotional and mental self-control you know exactly what do I mean? The mirror that I saw the staff coming into the field was doing everything in jest, playing the movie with reluctance. They make weblogs laugh, take pictures of each other. (Participant 15)

Training of the exercise personnel

Iranian health professionals believe that the organizational unit of exercise should take place before implementation of the original operational exercise using discussion-based exercises, including workshop and educational seminars preparing the employees for participating in exercises and also to be aware of their duties during operational exercise; any training to increase staff preparedness before operational exercise will increase their coordination and performance at the time of exercise to better prepare them for an emergency response during an actual incident:

There is definitely a role for training in various exercise stages, for example when designing an incident command system, we need to be trained. When we are organizing a team, we have to train them to see how they are organized; when we are equipping an organization, we should have the necessary training, the process of training is available in the whole phase of preparation because we see they design and execute the exercise within a day without having trained resources. Therefore, those that perform design and codify the exercise process have not received any training related to the exercise. (Participant 1)

Providing financial and logistic resources of the exercise

One of the essential needs of an exercise is the financial resources for the preparedness programs, especially the training and design of exercise. Most interviewees believe that human resources, equipment, and physical space are basic principles for an organization to respond to disasters through exercise:

I think financial regulations are not ready to compensate for the exercise costs and we do not see separate funding sources in the financial regulations of the organization, meaning there is no official financial document for the exercise costs and sometimes we may use other resources for preparedness and performance of the exercise. It is therefore imperative that the costs involved in designing and implementing the exercises be separately addressed in the financial regulations of the university and that the financial rewards following the exercise must also be pursued. (Participant 10)

Communication and general exercise information

The right communication is a system that can prepare organizations in disasters, with the highest possible capabilities.

Providing exercise information resources

Information is one of the most important and valuable tools in disasters and every manager needs it to decide when to respond to disasters. Health experts emphasized that the baseline database related to exercise resources—comprehensive information including telephone number, contact method and location of all exercise staff, and updated contact information for other centers and organizations related to disaster exercise at the organization (EOC)—should be prepared and updated every month:

It is very important that you have all organizational information from the down to the top at EOC, so that you can warn your employees when notification early warning and in addition have your personnel should be have a series information from another unit of inter-organization and even collaborate and logistic organizations in time of responding to disasters. (Participant 2)

Providing communication infrastructure

Standard communication means predicting the minimum appropriate communication platform between the executing organization (EOC) and all intraorganizational and interorganizational units participating in the exercise:

We should consider and use different communication and information methods, especially those that are less damaging in times of disasters, such as space-based technologies, for example, Remote control sensors or satellite mobile phones in the design phase of the exercise. (Participant 16)

When doing the exercises, we should check all ways of communicating with our organizational unit, or other organizations like the Red Crescent, the fire department, law enforcement, etc. because the first things that are d in disasters are the communication ways. (Participant 9)

Fourth Category: Providing Cultural and Social Priorities

Cultural factors are a set of functions consistent with the cultural context of the community for implementation of the exercise,

including observance of Islamic traditions, language, and culture of the local community, place of exercise, and public awareness of the exercise proportional to the type and level of exercise to prevent intimidation, panic, gossip, and disorder in the community:

Before an exercise is available to the media or the public, we must have a formal authorization from the highest-ranking person in the organization to execute the exercise. The organization, itself and at a higher level the Provincial Council and the Governor are responsible for this information and they should determine at what level the exercise needs to be informed. (Participant 8)

From the practitioners' viewpoints, the exercise should be proportional to the cultural context of the community, which can play an important role in enhancing preparedness. In addition to the health organizations, the community becomes more aware and prepared:

To do the exercise, we better use the reference organizations and people that are already involved in the matter. One part of them is engaged in this way and for the second part, we can randomly train the people of the area before the exercise takes place. (Participant 17)

An important and practical issue insisted by the participants was the presence of a very important person (VIP) during the exercise who would disrupt the exercise order and activities:

One thing that annoys a lot of people is the intrusive presence of high officials of the universities or the city in the middle of executing of exercise that disrupts exercise coordination and discipline. (Participant 4)

Discussion

The present study aimed to identify and explain the components affecting the design of preparedness exercises of the health system in disasters. The main components affecting the design of preparedness exercises in the health system are coordination, command and conduction of exercise, exercise hardware and software requirements, organizational exercise resources, communication, and general exercise information.

The findings of this study indicated that coordination, command, and conduction of exercise were one of the foundations for designing discussion-based and operation-based exercises of the health system in disasters. This finding is consistent with the study.^{20–22} Other studies have shown that for an organization to be fully prepared to respond effectively to an incident by conducting exercises, all constituent organizational units require synchronization and coordination of functions.^{23–25} Ardalan found that coordination was always a challenge in the incident management and that the health system should employ mechanisms to better collaborate responsible organizations and respond to incident so that information can be effectively exchanged between organizations.²⁶

According to the findings, the main foundation of the exercise program in the design phase is the provision of hardware and software requirements before executing the main exercise. Issues such as risk assessment and identification of hazards with priority, provision of risk map, operational incident plan, early warning program, exercise scenario, and execution of discussion-based exercise before operation-based exercise should be considered during the design phase of the exercise. Various studies suggest that risk assessment is a method that determines the nature and extent of the risk, and it is based on the analysis of potential hazards and the vulnerability of the property, livelihoods, and environment involved with risk or potential harm. The risk assessment process reviews technical aspects of hazards such as location, severity,

frequency, probability of occurrence, as well as analysis of physical, social, economic, and environmental aspects of vulnerability and exposure.^{1,5,27–29}

Providing organizational resources for exercise was one of the factors explaining the concept of the exercise design. This finding is consistent with studies conducted^{30,31} on exercise as one of the practical tools for maintaining and promoting organizational preparedness in disasters. Studies indicate that equipment and human resource are not enough for responding to disasters, but the physical space, education, and research are the requirements that an organization must consider to promote preparedness and response capacity.^{5,32–34} Some research has shown that supplying alternative staff commensurate with the situational assessment and identifying potential human resources capacities are factors affecting the organizational preparedness in disasters.^{35,36} Regarding the preparedness of health organizations through design and implementation of exercise, enhancement of the organizational efficiency is dependent on increasing the human resource efficiency, which in turn is dependent on developing knowledge, skills, and creating appropriate behaviors for successful performance to obtain preparedness in disasters.^{1,5,37,38}

Communications and public information on exercise was one of the main categories of interviewing with health experts. Some research has shown that predicting appropriate communication between organizations and important locations is one of the requirements of the organizational preparedness in disasters.^{39–42} Based on the participants' views, obtaining and exchanging incident information from reliable sources with the EOC and Department Operation Center (DOC), the University Headquarters, the incident command system; developing an information-seeking plan through an email, wireless, courier, and radio communications; developing information process through channels dedicated within the organization and dissemination of information through the EOC; and providing comprehensive information databases for staff are key indicators of communication and information to enhance organizational preparedness in disasters. In a number of studies, a multilayer communication system, wireless, Internet, courier, SMS, and satellite wireless indicate appropriate communication equipment to gain preparedness in disasters through the exercise.^{43,44}

Strengths and Limitations

The strength of this study is the diversity of participants from different sections of the health system, including prehospital, hospital, disaster risk reduction, health (environment, family, physiological), deputies of logistic, nutrition, and drug organization in the different universities of medical sciences in Iran. One of the limitations of the qualitative study was the bias in the analysis and interpretation of the results that maximized the consistency and accuracy of the study by using strategies such as checking the qualitative data with the selected participants and co-researchers at various stages of the analysis. In addition, comparing quantitative studies and the low number of participants are other limitations; however, rich and well-saturated information from participants could overcome them.

Conclusion

The findings of this study can greatly increase the attention of senior managers in all areas of health, especially managers of pre-hospitals and hospitals who are in the front line of the response to

disasters to design standard and scientific preparedness exercises. Therefore, with early detection, mitigation, and removal of the weak points of health system performance in duration of exercise and reinforcement of strengths after performing disaster exercises, economic, social, physical, and psychological damage by disasters can be prevented and decreased. This study provides a clear picture and rich, constructive information on the concept of designing health system preparedness exercises in disasters.

Data availability statement. The data sets generated during the current study are available from the corresponding author.

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References

1. Sena A, Forde F, Yu C, *et al.* Disaster preparedness training for emergency medicine residents using a table top exercise. *MedEdPORTAL* 2021;17:11119. doi: [10.15766/mep_2374-8265.11119](https://doi.org/10.15766/mep_2374-8265.11119)
2. Amiri H, Rezapour M, Nekoei-Moghadam M, *et al.* Translation and adaptation of the Posttraumatic Growth Inventory-Short Form into Persian. *Open Psychol J.* 2020;13(1):326-332.
3. Hospital and Health Facility Emergency Exercises: Guidance Materials. World Health Organization. Manila: WHO Regional Office for the Western Pacific. Published 2010. Accessed October 2020. https://iris.wpro.who.int/bitstream/handle/10665.1/5502/9789290614791_eng.pdf
4. Amiri H, Rezapour M, Nakhaee N, *et al.* Patterns of traumatic events and its relations with posttraumatic growth and religiosity in Iranian college students. *J Educ Health Promot.* 2021;10:276. doi: [10.4103/jehp.jehp_1147_20](https://doi.org/10.4103/jehp.jehp_1147_20)
5. Djalali A, Carenzo L, Ragazzoni L, *et al.* Does Hospital disaster preparedness predict response performance during a full-scale exercise? A pilot study. *Prehosp Disaster Med.* 2014;29(5):441-447. doi: [10.1017/S1049023X1400082X](https://doi.org/10.1017/S1049023X1400082X)
6. Beyramijam M, Khankeh HR, Farrokhi M, *et al.* Disaster preparedness among emergency medical service providers: a systematic review protocol. *Emerg Med Int.* 2020. <https://doi.org/10.1155/2020/6102940>
7. Amiri H, Nakhaee N, Nagyova I, *et al.* Posttraumatic growth after earthquake: a systematic review and meta-analysis. *Int J Soc Psychiatry.* 2021;67(7):867-877. doi: [10.1177/0020764021995856](https://doi.org/10.1177/0020764021995856)
8. Khankeh H, Golamreza K, Nasiri A. *Iranian national health exercise program.* Emergencies and Disasters Management Center of Ministry of Health and Medical Education; 2019.
9. Beyramijam M, Rasouli-Ghahfarokhi SM, Fathollahzadeh A, *et al.* The effect of education and implementation of "National Hospital Disaster Preparedness Plan" on an Iranian hospital preparedness: an interventional study. *J Educ Health Promot.* 2019;8:215. doi: [10.4103/jehp.jehp_208_19](https://doi.org/10.4103/jehp.jehp_208_19)
10. Beyramijam M, Khankeh HR, Farrokhi M, *et al.* Evaluating the disaster preparedness of emergency medical service agencies in the world: a systematic literature review protocol. *J Educ Health Promot.* 2020;9(1):351.
11. Suginaka H, Okamoto K, Hirano Y, *et al.* Hospital disaster response using business impact analysis. *Prehosp Disaster Med.* 2014;29(6):561-568. doi: [10.1017/S1049023X14001022](https://doi.org/10.1017/S1049023X14001022)
12. Skryabina E, Riley P, Reedy G, *et al.* A scoping review of evaluation methods for health emergency preparedness exercises. *Am J Disaster Med.* 2018;13(2):107-127. doi: [10.5055/ajdm.2018.0292](https://doi.org/10.5055/ajdm.2018.0292)
13. Blum JD, Paradise J. Public health preparedness and response: an exercise in administrative law. *DePaul J Health Care Law.* 2019;20(2):1.
14. McCreight R. *An introduction to emergency exercise design and evaluation.* Bernan Press; 2019.
15. Khankeh HR, Lotfolahbeygi M, Dalvandi A, *et al.* Effects hospital incident command system establishment on disaster preparedness of Tehran hospitals affiliated to law enforcement staff under simulated conditions. *Health Emerg Disasters.* 2018;3(4):207-214.
16. Heidaranlu E, Ebadi A, Khankeh HR, *et al.* Hospital disaster preparedness tools: a systematic review. *PLoS Curr.* 2015;7:1-19. doi: [10.1371/currents.dis.7a1ab3c89e4b433292851e349533fd77](https://doi.org/10.1371/currents.dis.7a1ab3c89e4b433292851e349533fd77)
17. Green J, Thorogood N. *Qualitative methods for health research.* SAGE; 2018.
18. Marshall C, Rossman GB. *Designing qualitative research.* SAGE; 2014.
19. Lincoln YS, GES. *Naturalistic inquiry.* SAGE; 1985.
20. Kaji AH, Lewis RJ. Assessment of the reliability of the Johns Hopkins/ Agency for Healthcare Research and Quality hospital disaster drill evaluation tool. *Ann Emerg Med.* 2008;52(3):204-210. doi: [210.e1-8](https://doi.org/10.1016/j.annemergmed.2008.03.011).
21. Labrague LJ, Hammad K, Gloe DS, *et al.* Disaster preparedness among nurses: a systematic review of literature. *Int Nurs Rev.* 2018;65(1):41-53. doi: [10.1111/inr.12369](https://doi.org/10.1111/inr.12369)
22. Norman ID, Aikins M, Binka FN, *et al.* Hospital all-risk emergency preparedness in Ghana. *Ghana Med J.* 2012;46(1):34-42.
23. Perry RW, Lindell MKJD. Preparedness for emergency response: guidelines for the emergency planning process. *Disasters* 2003;27(4):336-350.
24. Perry M. Natural disaster management planning: a study of logistics managers responding to the tsunami. *Int J Phys Distrib Logist Manag.* 2007;37(5):409-433.
25. Rüter A, Kurland L, Gryth D, *et al.* Evaluation of disaster preparedness based on simulation exercises: a comparison of two models. *Disaster Med Public Health Prep.* 2016;10(4):544-548. doi: [10.1017/dmp.2015.176](https://doi.org/10.1017/dmp.2015.176)
26. Ardalan A, Kandi M, Talebian MT, *et al.* Hospitals safety from disasters in IR Iran: the results from assessment of 224 hospitals. *PLoS Curr.* 2014;6:1-15. doi: [10.1371/currents.dis.8297b528bd45975bc6291804747ee5db](https://doi.org/10.1371/currents.dis.8297b528bd45975bc6291804747ee5db)
27. Khankeh HEA. *Collection of tools for risk assessment and health capacity indicators in emergencies and disasters.* Gisoum; 2014.
28. Ardalan A. *Disaster risk assessment in primary health care facilities.* Raze Nahan; 2011.
29. Becker R, Majers JS, Moody J. Disaster preparedness for charge nurses: a program evaluation. *J Emerg Manag.* 2021;19(1):39-45. doi: [10.5055/jem.0551](https://doi.org/10.5055/jem.0551)
30. Maher A, Yeganeh SM, Lari MA, *et al.* The study of the quality and capacity of equipments' functionality and non-structural vulnerability in selected Tehran general hospitals during an earthquake. *Int J Health Syst Disaster Manag.* 2014;2(2):93.
31. Zaboli R, Toufighi S, Amerioun A, *et al.* Survey of Tehran city hospitals disaster preparedness for disaster. *J Mil Med.* 2006;8(2):103-111.
32. Sorani M, Tourani S, Khankeh HR, *et al.* Prehospital emergency medical services challenges in disaster; a qualitative study. *Emergency.* 2018;6(1):e26.
33. Ardalan A, Najafi A, Sabzghabaie A, *et al.* A pilot study: development of a local model to hospital disaster risk assessment. *Hosp J.* 2011;9:7-14. <http://jhosp.tums.ac.ir/article-1-73-fa.html>
34. Emant N, Syed Hossein H, Arab M, Khankeh H. *A comprehensive guideline for designing and conducting exercise in disasters and guide for hospitals accreditation standards in disaster risk management.* Jame-negar; 2019.
35. Walsh DW, Christen Jr HT, Lord GC, *et al.* *National incident management system: principles and practice.* Jones & Bartlett; 2010.
36. WHO Expert Consultation. *Emergency preparedness for the health sector and communities—challenges and the way forward.* WHO Expert Consultation. Geneva, February 15-17, 2006. *Prehosp Disaster Med.* 2007;22(6):s187.
37. Higgins W, Wainright C, Lu N, *et al.* Assessing hospital preparedness using an instrument based on the mass casualty disaster plan checklist: results of a statewide survey. *Am J Infect Control.* 2004;32(6):327-332. doi: [10.1016/j.ajic.2004.03.006](https://doi.org/10.1016/j.ajic.2004.03.006)
38. Tang R, Fitzgerald G, Hou XY, *et al.* Building an evaluation instrument for China's hospital emergency preparedness: a systematic review of preparedness instruments. *Disaster Med Public Health Prep.* 2014;8(1):101-109. doi: [10.1017/dmp.2014.10](https://doi.org/10.1017/dmp.2014.10)

39. **Wiens ME, Wilson BJ, Honeywell C, et al.** A family genetic risk communication framework: guiding tool development in genetics health services. *J Community Genet.* 2013;4(2):233-242. doi: [10.1007/s12687-012-0134-9](https://doi.org/10.1007/s12687-012-0134-9)
40. **Aros SK, Gibbons DE.** Exploring communication media options in an inter-organizational disaster response coordination network using agent-based simulation. *Eur J Oper Res.* 2018;269(2):451-465.
41. **Brunton M, Cook C.** Communication in the clinic: negotiating nursing practice in sexual health clinics. *Int J Healthc Manag.* 2019;12(1):60-67.
42. **Savoia E., Biddinger PD, Burstein J, et al.** Inter-agency communication and operations capabilities during a hospital functional exercise: reliability and validity of a measurement tool. *Prehosp Disaster Med.* 2010;25(1):52-58. doi: [10.1017/s1049023x00007664](https://doi.org/10.1017/s1049023x00007664)
43. **Barbera JA, Yeatts DJ, Macintyre AG.** Challenge of hospital emergency preparedness: analysis and recommendations. *Disaster Med Public Health Prep.* 2009;3(S1):S74-S82.
44. **Fallahi A, Mahdavi L, Karimi A, et al.** Vulnerability of a military hospital against earthquake in Tehran based on personnel view and non-structural components. *Q Sci J Rescue Relief.* 2011;3(1). <http://jorar.ir/article-1-97-en.html>