Research Paper

Development of a National Guide for Designing the Structure of Makeshift Hospital: With Focus on Pandemics

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ABSTRACT

Background: Epidemics are threats to communities and their health. The preparedness of makeshift hospitals in epidemics in management, planning, implementation, and structure to provide appropriate and timely services is essential. Studies show that the incidence command system and the operational fact sheet based on task descriptions and instructions in makeshift hospitals are not considered. This study is designed to develop an appropriate organizational structure for makeshift hospitals.

Materials and Methods: This was a descriptive-analytical cross-sectional study in two stages, including review and expert panel studies, to develop a national fact sheet guide and the structure of makeshift hospitals.

Results: Based on the nature of disasters, makeshift hospitals should have specific structures. In the structure designed for a makeshift hospital, according to the center's services and time of activation, it is necessary to have a manager, management, and executive staff. A medical specialist, such as an infectious or pulmonary specialist, is essential, depending on the situation. Considering the limited resources in developing countries and the importance of managing resources (financial, human, and equipment) and improving the quality of health services, it will be helpful to formulate a management structure and implement operational worksheets in the least possible time.

Conclusion: The use of command and management structure will improve decision-making in critical situations, especially in cases of epidemics, the need for quarantine, and the provision of services to injured patients.

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Introduction

Epidemics are threats to communities and their health. Epidemics have deeply affected societies throughout history and drastically changed the economic, political, and social aspects of human civilization. Epidemics and outbreaks, such as COVID-19, irreparably impact psychological, social, and economic aspects and change the health service delivery system. Since epidemics are considered a threat to humans, their management is critical [1].

The COVID-19 infection was detected in December 2019 in Wuhan, China, with a high capacity to spread from one person to another quickly. It immediately spread worldwide [2] and was pronounced a critical public health concern by the World Health Organization (WHO) [3]. Iran is experiencing the widespread ongoing transmission of COVID-19 and is one of the level III warning countries with a total of 7 562 610 COVID-19 cases and 144 727 deaths (January 15, 2023, 17:49 GMT) [4].

After detecting COVID-19 and the first case on February 29, 2019, countries faced a short-term increase in inpatients. As one of the challenges for the healthcare system, health authorities were forced to plan and set up temporary hospital hotspots to provide care to patients and healthcare services. A total of 27 000 beds with suitable logistics and treatment systems were available in 300 areas [5]. The preparedness of makeshift hospitals for management, planning, execution, construction incidents, disasters, and epidemics is fundamental to providing appropriate and timely health services [6].

These centers can accept people who were not hospitalized; however, they need to be isolated and under care, and this possibility is unavailable to them at home [7]. Various services, such as medical, pharmaceuticals, nutrition, personal hygiene, education, health promotion services, mental health, and spiritual counseling, were offered to all patients in makeshift hospitals [8].

One of the practical components of managing medical centers in incidents and disasters is the presence of standard operating procedures and incident command systems [9].

Using globally recognized strategies to manage the hospital emergency management system can help improve the quality of healthcare services [10]. In makeshift hospitals, there is a need to plan an incident command system and describe the organizational obligations to respond appropriately and timely [11]. These documents are not specific regarding the features and type of services in makeshift hospitals. Considering that all countries in incidents, disasters, and epidemics require the establishment of makeshift hospitals, this study plans for an eligible and appropriate organizational construction to provide services an executive and operational plan to manage makeshift hospitals in epidemics, disasters, and incidents.

Materials and Methods

Study design

This was a cross-sectional descriptive-analytical study in two phases of review and Delphi studies to develop a public fact sheet guide and the construction of the makeshift hospitals.

In the first phase of the research, the required data was extracted by exploring the sources and texts of various documents regarding the makeshift hospital and the management of the diseases of the COVID-19 epidemic. The final records were analyzed.

In the second phase, the expert panel method was used to design the construction of the makeshift hospital.

Study participants

The participants consisted of professionals, policymakers, senior and middle managers, and experts in the health sector, such as the Ministry of Health and Medical Education, universities of medical sciences, health services, and the health network, and people with practical experience in setting up temporary hospitals. The participants were selected through the purposive sampling and then included in the study.

Data collection

In phase 1, all published documents regarding makeshift hospitals and disaster management were extracted without any time limitation. To design the search strategy, the "AND/OR" operators were used (Table 1).

Official documents of leading organizations intervening in disaster management or makeshift hospital establishments were also searched and analyzed. All records were collected and analyzed in 2022.

In the second stage, the fact sheet and management structure of the makeshift hospital are designed for validation, which is the result of the findings of the first stage

Table 1. A simple search strategy to identify the makeshift hospital management components

Database	Syntax
PubMed	(((makeshift) AND (hospital)) OR (“makeshift hospital”) OR (“fangcang hospital”) OR (“intermediate health center”)) AND ((Disaster()OR ((disasters) OR (emergency) OR (emergencies) OR (crisis) OR (pandemic) OR (pandemics)) AND ((“health system”() OR ((“health systems”) OR (“health care system") OR (“health care systems”) OR (“health care”) OR (“health care delivery”)) OR ((“health security”) OR (“health securities”) OR (“public health”) OR (“health field”) OR (“health delivery system”) OR (“public health system”) OR (“health sector”) OR (“health care sector”) OR (“health service”)) AND ((“preparedness”) OR (“preparation”) OR (“readiness”))

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of the research, and to reach the final model, the expert meeting method will be used with a qualitative approach. In this phase, the final structure is presented according to the opinions of the experts and experts involved. At the beginning of the meeting, explanations of the study objectives were given, after which the participants were asked to express their opinions on the factors extracted from the study’s first phase.

Data analysis

In this study, two researchers analyzed all documents and articles. Related components and ideas were extracted. In the second phase, the research team recorded and listened to the participants’ opinions several times. Necessary corrections were made to the factors. Based on the summary, some factors were removed, and others were added. In the second meeting of the expert panel, the revised draft design was presented and approved by the participants.

Results

Literature review

Based on the analysis of the available articles and documents, 18 articles were included in the study, the majority (85%) of which were published from 2015 to 2020. Most of the articles (43%) were done by content analysis method 40% of the documents were upstream documents, and the rest were articles. Most of these articles described the hospital’s incident command system and the staff and roles involved in its management. These articles mentioned the presence of the director, safety consultant, public relations consultant, operation, planning, and support unit. Table 2 describes the findings of this step.

Table 2. Content analysis resulting from the literature review

Categories	Subcategories	Codes
Management	Commander	Deciding to set up a makeshift hospital Designing the overall service delivery program in the makeshift hospital Employing human resources Interaction with other organizations
	Public relations	Acting as a spokesperson Responsible for compiling and publishing appropriate information Continuous monitoring of cyberspace and preparation of news content for publication in social media and cyberspace Continuous documentation of actions taken
Executive	Operational unit	Developing a patient care plan Providing specialized and general services to patients Providing additional services to patients Preparing a daily report on the status of the makeshift hospital
	Supportive unit	Supporting activation command Provision of all personnel, equipment and services Tracking the allocation of related costs
Special services	Supportive care	Providing nutritional counseling services Providing mental health services Providing spiritual health services
	Situational care	Providing support services to needy patients Providing infection control services in epidemics

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Table 3. Details of the participants in the expert panel

Participant Code	Gender	Age	Degree	Major	Occupation	Experience
P01	Male	37	PhD	Nursing	Supervisor	13
P02	Female	39	PhD	Health in disasters and emergencies	Secretary of the hospital's risk reduction committee	10
P03	Male	44	Specialist	Emergency medicine	Head of the emergency department	15
P04	Male	41	PhD	Health in disasters and emergencies	Faculty member	9
P05	Female	40	PhD	Health in disasters and emergencies	Faculty member	15
P06	Male	33	MA	Nursing	Head nurse	8
P07	Female	50	PhD	Management of healthcare services	Hospital manager	26
P08	Male	47	Specialist	Infectious disease specialist	Infectious disease specialist	18

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Expert panel

Based on the findings of the first stage, a general diagram of the chain of command of the makeshift hospital was designed. In the panel of experts, which was formed with experts in the hospital and disaster management (the demographic information of the participants is shown in Table 3), the management framework of the makeshift hospital and the description of the duties of different units were finalized.

Considering the limited resources in developing countries and the importance of managing resources (financial, human, equipment) and improving the quality of health services, developing an administration construction, implementing operations, and operational fact sheets will be helpful. The makeshift health system hospital can be operated in the shortest possible time. This study explained the operational construction of a makeshift hospital as follows. The construction intended for makeshift hospital is displayed in Figure 1.

The administrative and operational construction of the makeshift hospital is taken from the hospital incident command system. Utilizing the hospital incident command system can create preparedness in the face of disasters, constructive management in disasters, and disaster management strategies. The preparation of the makeshift hospital in pre-crisis conditions will be increased based on various components, such as command, communication, security, safety, planning, and operations. Depending on the type of services and the activation time of the makeshift hospital, the presence of the head of the makeshift center and a management group consisting of a liaison officer, a security officer, a coordination officer, a security officer, and a specialist doctor is essential. This is similar to a hospital's operations control system.

In addition to the general structure, for each position, the description of duties, hierarchy of responsibility, qualification conditions, training, operational history, preparation, and physical health have been explained, which can be seen in Table 4.

Discussion

Considering the limited resources in developing countries and the importance of managing resources (financial, human, equipment) and improving the quality of health services, it will be helpful to formulate a management structure and implement operational worksheets in the least possible time. This study extracted two executive documents named the fact sheet and operational structure of makeshift hospitals.

All the staff of the makeshift hospital should be familiar with their duties; therefore, changing the attitude of staff through training and effective operational exercises, creating required drills, and the time interval between the occurrence of incidents and disasters and epidemics and the establishment of the makeshift hospital will be minimized [12].

The hospital incident command system is a flexible and applicable model in all hospitals [13]. This principle also applies to the construction of temporary hospitals. It is the only active operational unit among the four executive units in the hospital's operational control system, and the

Table 4. Operational fact sheet of the makeshift hospital

Management Level	Prioritized Actions
Dean of the university	- Forming a makeshift hospital startup committee - Determining the goals of setting up a makeshift hospital home - Approving and communicating the operational plan - Prioritizing activities to set up a makeshift hospital home - Determining the level of the university's capacity to set up a makeshift hospital according to the initial evaluation report - Issuing an order to meet the declared needs to maintain the continuity of health services in the intermediate care center - Approving the financial credits of the support, financial and administrative department - Managing and leading the activity of operational areas through the treatment and health assistants - Issuing an order to mobilize the resources of health and treatment networks based on the initial assessment report - Continuous receipt of statistics and information from EOC - Requesting a report on the measures taken and the resources needed from the vice president of treatment and health - Granting permission to the public relations chief to publish news - The order to announce the end of makeshift hospital services, according to EOC reports and statistics
Director of EOC	- Establishing a continuous and reliable communication - Pursuing logistics needs from cooperating and supporting organizations directly or through the Provincial Crisis Management Coordination Council - Facilitating university and communication between the president of the senior managers of other related organizations - Providing statistics and information required by other organizations with the approval of the university president - Coordinating affairs with other organizations
Director of public relations of the university	- Providing advice to the president of the university regarding the release of information and media relations - Acting as a spokesperson and providing necessary information as a point of contact with the media - Responsible for compiling and publishing complete and appropriate information - Coordination with other active forces in public information - Continuous monitoring of cyberspace and preparation of news content for publication in social media and cyberspace - Continuous documentation of actions taken
Director of the technical office and physical resources	- Participating in choosing the right place to set up a makeshift hospital home - Providing advice to the university president to consider safety measures - Supervision and evaluation of structural and other structural safety of intermediate care center - Monitoring the standards of makeshift hospital spaces
Security manager	- Organization of physical protection teams to establish order, security, and protection of employees and equipment in the interstitial care center - Planning and monitoring how to manage congestion in the interstitial care center - Creating the necessary arrangements for the management and passive defense measures
Head of pre-hospital emergency and incident manager of the university	- Proposal to determine the number of interstitial care centers needed based on population index, number of patients, number and distribution of treatment centers, and age distribution of the covered population to the university president - Presenting the necessary program to the university president - Preparation of appropriate strategies based on the university's EOP - Continuous communication with units and receiving reports and statistics - Obtaining continuous reports on the performance and actions of makeshift hospital centers - Continuous review of the process of providing services in the interstitial care center - Constantly checking the status of providing services and spending resources and providing continuous reports to the president of the university - Correcting and updating the contingency plan based on the information received - Forecasting and estimating the needs and announcing to the head of the financial and administrative support department - Providing a service continuity plan - Coordinating the transfer of patients from the hospital to the makeshift hospital and vice versa - Holding and directing planning meetings - Preparing an online report and displaying the current situation for the use of the university president and sending it to the competent authorities - Collecting, analyzing, and sending reports on the needs of infrastructures and facilities of the health - Formulating and presenting the plan for the return of the health field from emergency to normal conditions to the president of the university - Preparing the final report of the services provided and submitting it to the university president for approval and publication

Management Level	Prioritized Actions
Vice president of university management and resource development	- Support activation command - Planning, providing, allocating, and distributing the funds needed for the interstitial care center - Setting up contracts and facilitating the process of receiving goods and services in critical conditions - Provision of all personnel, equipment, and services required for the interstitial care center - Replacing and updating the human and physical resources of the support area based on a regular calendar - Tracking the allocation of related costs - Presenting a continuous report on the supply and distribution of resources to the university president - Recording and documenting expenses - Documentation of tax calculations
Director of inspection and performance evaluation of the university	- Calling and forming inspection and performance assessment teams to be sent to the interstitial care center - Presenting continuous performance evaluation reports and inspections to the university president - Examining the level of satisfaction of service recipients in the field of health based on a predetermined mechanism and providing continuous reports to the university president - Follow up and deal with complaints related to service recipients and service provider employees - Compilation and presentation of the final report of the performance evaluation of the health sector
Deputy of treatment	- Obtaining the necessary plan from the head of the accident and emergency management center - Management of service provision in the interstitial care center - Supervising the implementation of programs to increase the capacity of the interstitial care center - Managing the balanced distribution of patients between the care centers of the intermediate care center - Issuing the necessary orders to support to meet the logistical needs of operational treatment units - Notification of the need for medicine and consumables needed for treatment to the Vice President of Food and Drug Administration - Implementation of the continuity plan for the provision of medical services - Replacement and updating of medical staff and equipment in the interstitial care center - Submitting a comprehensive and final report on the actions and performance
Deputy health	- Obtaining the necessary plan from the head of the accident and emergency center of the university and communicating it to the comprehensive health centers - Estimating the logistics needs of health operational units - Submitting a report on the actions and performance of the health field - Continuous assessment of the health status and needs of the intermediate care center - Submitting a comprehensive and final report on the actions and performance - Necessary planning to monitor the way of keeping, transporting, and sanitary burial of corpses with the cooperation of the working group of the relevant deputy health department and based on the EOP of the university. - Compilation of a comprehensive program for monitoring the disposal of normal waste and hazardous waste with the coordination of environmental health and occupational health groups
Vice president of food and drug	- Estimating the medical and equipment needs of the interstitial care center - Coordinating with the pharmaceutical companies of the contracting party to provide the necessary medicine and medical equipment - Pharmaceutical support and supply of consumables needed by the interstitial care center - Presenting a comprehensive and final report of actions and performance
Educational deputy	- Planning, supply, allocation, and distribution of resident forces - Follow- up and compilation of the master plan for the interstitial care center - Compilation of programs, instructions, and required implementation methods - Appropriate allocation of doctors to the interstitial care center

EOC: Emergency operation center.

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support and financial management units have also been combined. As indicated by a similar guideline, the operational unit of the makeshift hospital construction includes sub-branches of nursing services, such as nurses who provide services, infection control, paramedics, education and health promotion [14], and medical services (emergency medicine and infectious/internal medicine specialist) and mental health. The specialist doctor will change based on the incident's type, severity, and extent and patients' need for health services.

The support/administrative-financial unit also includes the manager's sub-branches of employees' attendance and absence, admission, discharge and archiving, medical equipment expert, cost and resources manager, services, environmental health expert, and nutritional health expert. All of these units will be removed or activated according to the mission and activity level of the makeshift hospital and at the manager's discretion.

As mentioned in the study by Dehghani et al., safety and infection control lead to the safety of makeshift hospitals [15]. In this study, the presence of the safety officer and the infection control nurse are among the main elements of the makeshift hospital management structure.

In addition to the general construction, the description of assignments, hierarchy of responsibility, qualifica-

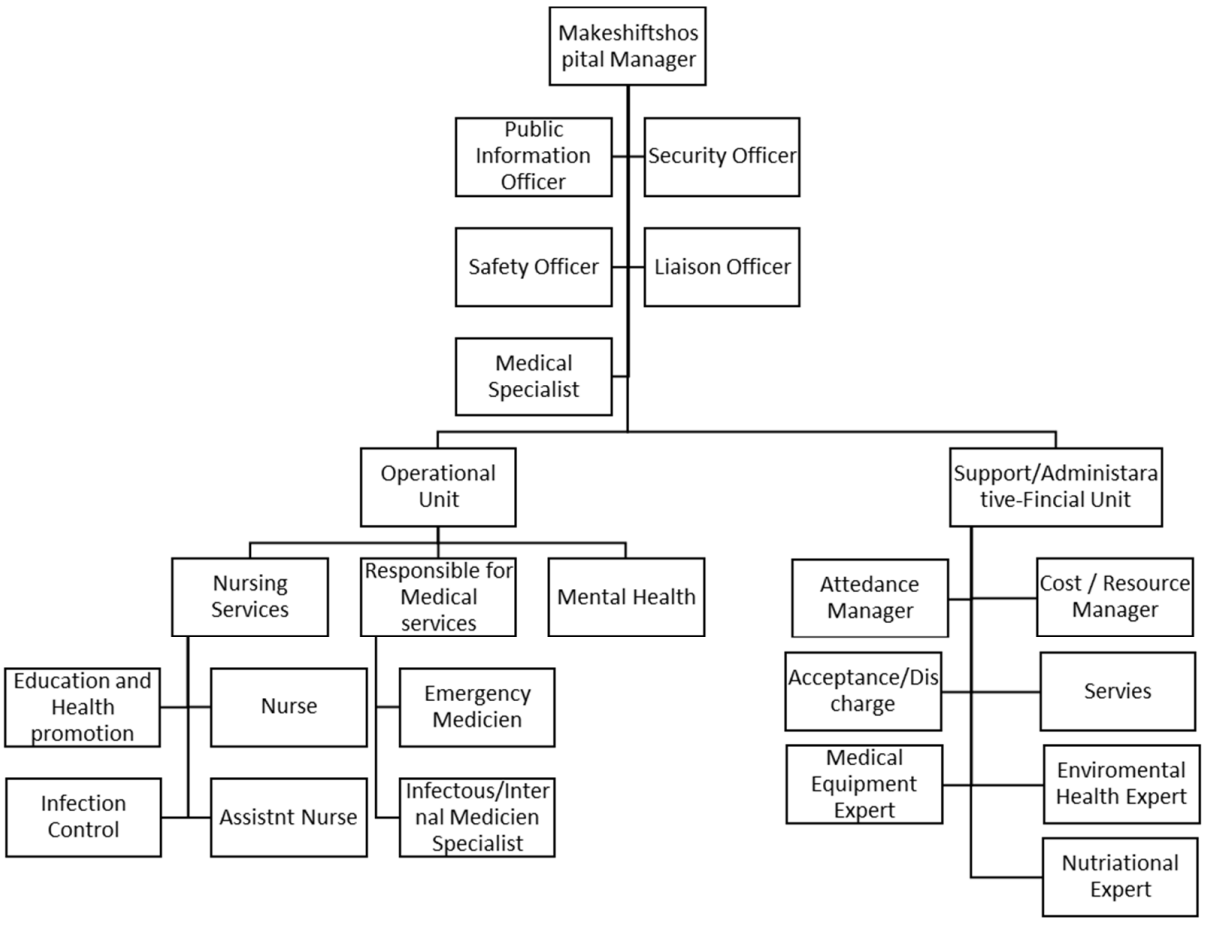

Figure 1. Administrative structure of makeshift hospitals

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tion conditions, educational history, operational history, preparation, and physical health have been explained for each position. The clarity of these indicators will reduce the parallel work and chaos in providing services and lead to integrated management [16]. This construction is planned at the management level of the intermediate health center. However, this center operates under the supervision of the University of Medical Sciences and Health Services. Furthermore, these centers are similarly associated with other hospitals and medical centers [17]. This administrative construction can be used to manage emergency military expedients for optimal use of resources and infrastructure.

Conclusion

The preparedness of a temporary hospital acts as a mediator, communicator, and exchange of resources between organizations and healthcare facilities. The existence of a command and administrative structure with a description of specific tasks and an explanation of how to communicate and coordinate between the management and other departments of health centers. By interacting with other collaborating and supporting organizations, the quality of services is improved, and the mortality rate of patients is reduced. The use of command and management construction improves decision-making in critical situations, which increases the need for quarantine, the need to care for large numbers of injured, the speed of decision-making, and the adoption of critical decisions in golden times during epidemics.

Study limitations

Since most of the incident command system was designed and implemented for hospitals, the structure and information sheet for health centers in this study were designed through qualitative studies and document review.

Ethical Considerations

Compliance with ethical guidelines

The present research is a part of choosing the best place to set up a makeshift hospital using a genetic algorithm in Tehran, Iran, emphasizing disaster management and epidemics, which the Ethics Committee of Iran University of Medical Sciences approved (Code: IR.IUMS.REC.1401.807).

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Authors' contributions

Conceptualization, data collection, study design, analysis and interpretation of results: Zahra Eskandari and Arezoo Dehghani; Draft manuscript preparation: Zahra Eskandari; Review and final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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