

# Research Paper: Evaluation of Operational Readiness of Prehospital Emergency Department of Mazandaran University of Medical Sciences in Encountering COVID-19 Epidemic in 2020



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## ABSTRACT

**Background:** The ability to respond to any emergency before happening is a potential issue that manifests as operational readiness. This study aimed to evaluate the preparedness of prehospital emergency services of Mazandaran University of Medical Sciences in response to the epidemic of COVID-19.

**Materials and Methods:** This cross-sectional study was performed in April 2020 using a translated standard checklist of the Pan American World Health Organization (PAHO). The list consists of four components of call management (6 items), first responders (operational codes with 3 items), medical transportation (including primary and interhospital with 16 items), and emergency medical services administration (including medical guidelines, human resources, and education with 11 items).

**Results:** There were 168 operational logistics facilities and 555 personnel to cover organizational missions. Except for two items that scored half a point, the rest of the measures received total points (35 out of a maximum of 36 points with 97% of the total points). According to the complete scores, operational readiness was at a good level.

**Conclusion:** The preparedness of the Center for Disaster Management and Medical Emergencies at Mazandaran University of Medical Sciences in the face of the COVID-19 epidemic has been at a good level. However, because of the continuation of the epidemic, strengthening the supply chain and empowering personnel are essential to sustainable readiness.

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## 1. Introduction

According to the latest technical report of the United Nations Office for Disaster Reduction, an epidemic of infectious diseases is a natural disaster [1]. In recent years, the outbreak of infectious diseases has severely damaged the health system and economy of countries and has even endangered the sovereignty of governments [2]. Contagious diseases with high mortality and complications are among the target diseases in the infectious disease care system of international importance. As a result, the World Health Organization has established a coordinated care system at the level of the international community [3, 4]. Proper management of infectious diseases is the health system's goal, which requires the establishment of a care system with a timely response to all its components and elements [5]. This care system includes regular and continuous collection, processing, analysis, and interpretation of data. It requires an effective response to goals such as eradication, disease elimination, or disease control. These are the main functions and support that applies in the case of the infectious disease care system [6, 7]. One of the functional components of the infectious disease care system is the identification and treatment of infected patients. Prehospital emergency is one of the front lines of dealing with patients, identifying suspects and transferring them to medical centers. These actions are based on the instructions of infectious diseases care system. This system is based on symptoms or syndromic care announced by the Ministry of Health and Medical Education and has a very effective and critical role [8].

All epidemics in the history of humans had some common characteristics: the occurrence of high mortality and rapid response of the health system in general and prehospital emergencies in particular. All countries try to control the extent of the epidemic and the resulting mortality [9]. The experience of previous studies has shown that the existence of a reliable and sufficient system in the prehospital emergency in response to health emergencies, especially the urgency of infectious diseases, is necessary [10, 11]. The role of prehospital emergency preparedness in controlling infectious diseases, especially emerging types, was studied by Faraq and associates. They argued that the history of response to previous epidemics does not predict the operational readiness of the health system. The adequacy of the system requires the necessary studies at the time of occurrence of diseases with high pathogenicity and transmissibility [12]. Jadidi et al. conducted a study in Iran in 2019 on the

practical adequacy and efficiency of prehospital emergency services in the face of Ebola. They found that the average score obtained in the study against Ebola was higher than the standards and indicated that the system was relatively well prepared. Still, due to the increasing threats and variability of biological agents, the use and implementation of some measures to strengthen the operational readiness of prehospital emergency medical services against similar infectious and infectious diseases are inevitable [8].

Readiness is defined the set of measures taken to increase the ability to respond to any emergency before it occurs. In an emergency, the necessary preparedness to respond appropriately to what has happened is known as operational preparedness. This study aimed to evaluate the operational readiness of prehospital emergency in response to the epidemic of COVID-19 at Mazandaran University of Medical Sciences.

## 2. Materials and Methods

This cross-sectional study was performed in April 2020 using standard tools developed by the Pan American World Health Organization to assess the readiness of prehospital emergencies in response to COVID-19 [13]. In this regard, immediate and priority measures were identified to provide an efficient and timely response in the prehospital emergency. The checklist was translated and then reviewed and approved by a group of experts and managers. This study was reviewed and approved by the Ethics Committee of Mazandaran University of Medical Sciences (Code: IR.MAZUMS.REC.1399.213).

The checklist reviews the four components of prehospital emergency services as follows:

- Access to a single number for an emergency call and dispatch services (6 items)
- First responders (operational codes) (3 items)
- Transfer of patients to hospital or interhospital, in addition to basic and advanced life support measures (16 items)
- Management (including medical guidance, human resources, and education) (11 items)

In each part, the components were identified by three conditions. First, when the required methods and protocols have been provided, implemented, and completed and also the recommended equipment has been available. This condition was considered completed and

scored 1. If methods or protocols have been designed but not implemented or approved, and the equipment has been purchased but not available for use, the condition was considered ongoing with a score of 0.5. If the recommended method/protocol and or equipment have not been provided, the condition was considered incomplete with a score of 0. The checklist used in the study was completed with the cooperation of supervisors and heads of units and a partner evaluator in the research project.

The total score ranges from a maximum of 36 to a minimum of 0. Radar charts were used to show the obtained results and to identify weaknesses in operational readiness. In addition, to make the results based on points tangible according to the reference checklist guide and also the experts' opinions, earning 90% or more (32 points and above) referred to good operational readiness, earning 60%-90% (22-32 points) was considered average operational readiness and gaining 40% to 60% (14 to 21 points) was insufficient operational readiness and gaining less than 40% (less than 14 points) was unacceptable operational readiness. The results of the analysis were presented in the form of descriptive tables and bar graphs.

### 3. Results

Table 1 presents the operational units, facilities, equipment, and human resources available in the Medical Emergency and Accident Management Center (Emergency 115) of Mazandaran University of Medical Sciences to cover organizational missions by operational logistics and human resources.

Overall, except for two items, the total score was obtained in other items, due to the appropriate situation and necessary measures. Thus, the 115 Emergency Department of Mazandaran University of Medical Sciences scored a total of 35 out of a maximum of 36 points (97% of the total points). The two scores that received incomplete scores were the question of "Was there a place for decontamination and disinfection of ambulances and equipment at the base or hospital?" from the medical transfer component, and the question of "Are there trained, available and sufficient staff available to cover the management of dispatch centers/messages and ambulances?" Concerning the management component 115/Emergency Services, these items received half of the points because were in the ongoing status (Table 2).

Overall, the components of contact management and first responders received total points, and the components of medical transfer (including primary or inter-hospital

and management 115/emergency services received 97% and 95% of the total points, respectively (Figure 1)

### 4. Discussion

This study was conducted to determine the level of pre-hospital emergency preparedness of Mazandaran University of Medical Sciences in the face of the COVID-19 epidemic in 2020. According to the results, the readiness of the system is good, i.e., more than 90% of the total points were obtained. According to the results, in only one measure of the two components of medical transfer and emergency services, half of the points were obtained due to the ongoing status of measures. The study results indicate the necessary emergency preparedness of 115 Mazandaran University of Medical Sciences in the face of the COVID-19 epidemic. The obtained results are expected according to the comprehensive and continuous approach of annual training and remote, single-skill, functional and full-fledged exercises held in Mazandaran Medical Emergency and Accident Management Center as in previous years. So that in the last several years, this university has continually acquired the title of the best center in the field of holding general and specialized training courses in the country.

One of the measures of the medical transfer component that did not get the maximum score was the lack of a place for decontamination and disinfection of ambulances and equipment at the destination base or hospital. It seems that due to the importance and sensitivity of the issue of eradication of infectious cases and the need to disinfect ambulances and equipment after missions of definite or suspected patients, relevant managers and officials should take urgent action to locate the desired location. In the emergency services management component, one of the measures that did not receive a total score was the lack of trained, available and sufficient staff to cover the management of dispatch/message centers and ambulances. One of the essential components of the performance of prehospital emergencies is education. Gomez's study mentions that the development of prehospital emergency system skills needs investment, education, and technology [14].

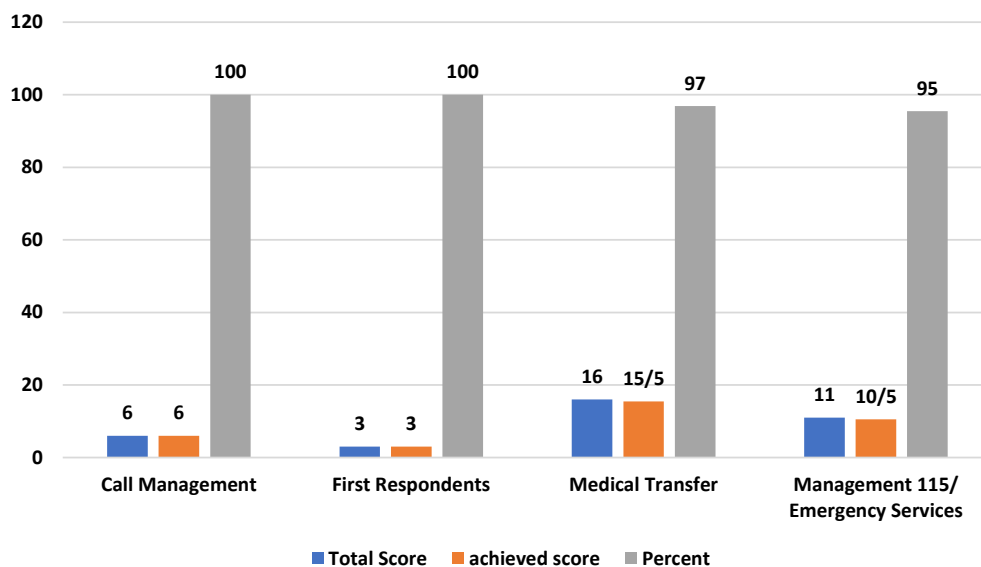
Accurate and timely access to information is essential to respond promptly and appropriately in a public health emergency. In a study conducted by Oliver et al. in the United States, a conceptual model was presented that examined the readiness of the prehospital emergency system in the face of influenza pandemics and the need for a specific approach to data collection and in-depth evaluation of its adequacy and performance [15]. Another 2020

**Table 1.** Information of human resources and operational logistics of 115 Mazandaran University of Medical Sciences

Resource area	Title	Number	Total
Operational logistics	Non-emergency vehicles	0	
	Basic life-saving ambulances	74	
	Advanced life-saving ambulances	88	
	Ambulance/air ambulance	1	168
	Ambulance/boat ambulance	0	
	Fast response feeds	3	
	Motor lance (evaluator)	2	
Human resources	Basic medical technician (Rescuer)	9	
	Central medical technician (emergency technician, anesthesiologist, etc.)	235	
	Paramedic number (emergency expert)	37	555
	Nurse	261	
	Doctor	13	

study was conducted by Ventura et al. on the response to US emergency medical services and their implications during the globalization of COVID-19. While pointing to the fundamental role of emergency medical services in the overall epidemic response infrastructure, they reported that the country’s EMS response model was severely hampered in areas, such as resource availability, continuing education, administrative protocols, and decontamination processes, and the current EMS system

is not sufficiently prepared to respond to a severe epidemic. There is also little emotional support from retired EMS professionals [16]. For operational coordination in Iran, a center was established in recent years as a gathering place and information to all relevant units under the name of Emergency Control and Guidance Center in the Ministry of Health, Treatment, and Medical Education. Infectious disease control programs have been started in the Islamic Republic of Iran for more than 70 years and



**Figure 1.** Comparing the total scores of the four components of the checklist

Table 2. Checklist metrics by four components studied and scores obtained

Components	Goals	Checklist Metrics	Score	Total Points
Call management	Ensure proper call forwarding to 115 or message centers to activate emergency medical resources	Availability of an IT-based platform for the correct classification of alerts, call management, and information management	1	6
		Clear and established mechanisms of communication/coordination with officials in health centers and entry points for case reporting and patient transfer	1	
		Contact response protocols have updated COVID-19 questions that include symptoms and risk factors based on case definitions (travel history to virus-affected areas).	1	
		Pre-ambulance guidelines are available for first responders or family members. (Questions or tips should not delay immediate life-threatening counseling)	1	
		Existence of pre-arrival protocols (post-dispatch information protocols) of operational units to ensure proper use of the equipment and personal protection measures.	1	
		Availability of a mechanism for regulating and coordinating inter-hospital transfers	1	
The first respondents	Facilitate system activation and initiation of treatment by first responders or callers	Identify and establish communication method/protocol with 115 and ambulance dispatch center to inform emergency personnel in possible cases of COVID-19	1	3
		Operational methods	1	
		Basic life-saving measures are in place in coordination with responsive technicians.	1	
Medical transfer (including primary or inter-hospital)	Establish safe treatment (including essential and advanced life support measures) and ensure proper transfer of patients to destination medical centers	Disinfection methods	3	15.5
		Ambulance codes and post-operation disposal of infectious waste are installed in the emergency system.	1	
		Establishment of information methods to the hospital before the patient enters the integrated network of health services to accept and prepare the emergency department to receive suspected or confirmed patients.	1	
		Clear and established mechanisms for communication/coordination with relevant authorities to report ambulance movement and patient transfer	1	
		Methods for inter-hospital transfers with 115 or integrated health service dispatch centers/networks have been identified and established.	1	
		Locating and determining the separation of the driver's cab from the treatment chamber or the use of HEPA filter in the air conditioning circulation	1	
		Proper availability of hand sanitizers in the ambulance	1	
		Access to a specific and appropriate disposal site for infectious/biological waste in the ambulance	1	
		There are care protocols for managing the transmission of definite or suspected coronary cases.	1	
		Airway management and ventilation protocols include all techniques associated with aerosol production risk.	1	
		Manual air conditioners with High Efficiency Particulate Absolute (HEPA) filters are available in the valve.	1	
		The filtration capacity of the ventilators used in the ambulance and their effect on positive pressure ventilation were evaluated and confirmed.	1	
		The forms used in the ambulance intervention report were reviewed and updated for all actions related to the suspected cases to be provided to the destination hospitals or authorities (type of care provided and exposure information).	1	
		Establishment of ambulance staff hygiene methods and cleanliness of medical areas in the ambulance	1	
		A place for decontamination and disinfection of ambulances and equipment was considered at the destination base or hospital.	0.5	
The necessary method for proper disposal of bio/ infectious waste was considered after the end of the mission or change of work shift.	1			
Necessary methods were considered to manage the bodies at the scene or during the transfer.	1			
Establish methods of informing the hospital before the patient enters the integrated network of health services to accept and receive suspicious or definite patients and facilitate the actions of the emergency department.	1			

Components	Goals	Checklist Metrics	Score	Total Points
Management 115/Emergency Services	Ensure proper operation of 115 emergency/dispatch centers/message/emergency services	There are trained, available and sufficient staff to cover the management of dispatch/message centers and ambulances.	0.5	10.5
		Personnel exposure risk assessment and management protocols with COVID-19 were developed, established, and reviewed.	1	
		Emergency personnel release and quarantine protocols are developed and implemented.	1	
		Periodically updated and maintained all emergency procedures to respond to COVID-19.	1	
		All emergency personnel is trained to diagnose, isolate, and report.	1	
		Early response program members are trained in the initial management of suspects.	1	
		All ambulance personnel is trained to evaluate and provide primary medical care to suspected COVID-19 cases.	1	
		All ambulance personnel is trained in the use of personal protective equipment and COVID-19 transport methods.	1	
		All ambulance personnel is trained in the decontamination of equipment and vehicles.	1	
		The communication and coordination system with 115, patient admission centers, integrated health services network, and officials involved in inpatient case management is operational.	1	
		The official spokesperson is appointed and coordinated with the relevant officials.	1	

have undergone many revisions along with international developments. Before the publication of the International Health Regulations (2005) [4], the Bam earthquake in 2003 was a turning point in a new approach to managing the country’s contagious diseases. The first program to control infectious diseases in natural disasters was launched with an emphasis on the control of infectious diseases in earthquake-stricken areas [17]. Subsequently, the operational plan of health units in the event of disasters was developed with the focus on internal and external planning and coordination in the crisis operations guidance and coordination center in the Ministry of Health, and the help of professors and experts. In this plan, the prehospital response program and the management of diseases, as well as the determination of how to cooperate and interact with different operational units, were determined [18].

The epidemic of COVID-19, which started in China, is now declared by the World Health Organization as the target disease of the global care system [19]. Our country has also been one of the countries where the disease has widely spread. Preparation for the effective response of the health system in general and prehospital emergencies, in particular, is crucial in controlling the extent of this epidemic [10]. According to the present study results, the operational readiness of the Medical Accident and Emergency Management Center of Mazandaran University of Medical Sciences in the face of

this epidemic is at a good level. However, because of the continuation of the epidemics, strengthening the supply chain and empowering personnel is essential to continue this readiness. One of the limitations of this study was the evaluation of emergency bases with self-assessment tools delivered by officials within the organization. It is suggested that an investigation be conducted with a joint and trained evaluator.

**Ethical Considerations**

**Compliance with ethical guidelines**

This study was reviewed and approved by the Ethics Committee of Mazandaran University of Medical Sciences (Code: IR.MAZUMS.REC.1399.213).

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**Authors' contributions**

All authors equally contributed to preparing this article.

**Conflict of interest**

The authors declared no conflict of interests.

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