

Health Information and Communication System for Emergency Management in a Developing Country, Iran

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Abstract Disasters are fortunately rare occurrences. However, accurate and timely information and communication are vital to adequately prepare individual health organizations for such events. The current article investigates the health related communication and information systems for emergency management in Iran. A mixed qualitative and quantitative methodology was used in this study. A sample of 230 health service managers was surveyed using a questionnaire and 65 semi-structured interviews were also conducted with public health and therapeutic affairs managers who were responsible for emergency management. A range of problems were identified including fragmentation of information, lack of local databases, lack of clear information strategy and lack of a formal system for logging disaster related information at regional or local level. Recommendations were made for improving the national emergency management information and communication system. The findings have implications for health organizations in developing and developed countries especially in the Middle East. Creating disaster related information databases, creating protocols and standards, setting an information strategy, training staff and hosting a center for information system in the Ministry of Health to

centrally manage and share the data could improve the current information system.

Keywords Emergency management · Information · Communication · Preparedness · Information system · Disaster

Introduction

Emergency Management (EM) encompasses a wide range of elements from preparedness, humanitarian assistance, training, emergency response, planning, disaster medicine, public health to recovery and rehabilitation [1]. Each element involves special responsible organizations, so to avoid any disturbance there is a necessity for a great deal of communication and cooperation between different organizations before, during and after a disaster. Unfortunately, even in developed countries, organizations often fail to effectively communicate with each other [2–4]. Initial research in the field of emergency response indicates that communication between responding agencies is a major shortfall in effective emergency response [5–7].

The situation is expectedly worse in developing countries where insufficient infrastructure, mismanagement and several other factors contribute to worsening disasters' consequences. Iran, as a developing country in the Middle East, is susceptible to a range of natural and human-made disasters. For example, Iran lies on numerous fault lines making it susceptible to earthquakes. The 2003 Bam earthquake (26th December) took a death toll of more than 30,000 people. Flooding also occurs frequently in Iran. Being neighbor with unstable and war-ravaged countries (e.g. Iraq and Afghanistan) makes Iran also susceptible to disease related disasters such as epidemic cholera.

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This article investigates the information and communication system of Iranian health organizations in response to disasters. It tries to understand the extent to which the current system of EM meets the necessities of information and communication especially in preparedness and response phase of emergencies. The aim is to analyze the findings and propose recommendations for improvements that can be useful for the developing countries.

Literature review

Several studies on EM in the past have confirmed the importance of information flow and communication during a disaster situation [8–15]. This importance has also been reflected in the WHO's set of benchmarks, which is meant to be used as guidance and to enable evaluation of a country or a sub-national areas' performance in EM. One of them is 'Advocacy and awareness developed through education, information management, and communication (pre, during, and post-event)' (13:151). It was argued that effective communication is critical among employees and managers responsible for coping with the disaster, and key people who may be remote from the disaster site must be kept informed [8, 16]. Further, restrictions in the communication process, as well as its content, could hinder an organization's EM capacity [17]. Pauchant and Mitroff point out that the unavailability of information and the weakness of communication stand as a barrier to prepare for effective EM [18]. It has been found that there is a positive relationship between the availability of information and emergency preparedness [19].

Effective data and information collection and quick communication of information which is an essential resource that translates into supplies, logistics and cooperation among relief agencies are keys to success. However, the biggest challenge in a community could be that data and information are widely distributed and owned by a large number of organizations. Some relief agencies have their own data sources while others do not and even have no idea of what information the other agencies have that might help them in decision making or emergency response [20].

Information and communication problems have been identified in several studies in the past [6, 8–14, 21]. For example, a review of the Toronto critical care experience of coping in the SARS (Severe Acute Respiratory Syndrome) outbreak disaster showed that the system was unprepared for the event, and as a result the impact that SARS had was worse than what it could had been. The review highlighted a range of communication issues. For example, inability to provide the right information to the affected people resulted in their increasing fears. Inaccurate information, especially in the media, resulted in fear, anxiety and even chaos. The authors

made some suggestions to improve the system including creating a website for effective communication [22].

A study of bioterrorism showed that informatics has a prominent role to play in the detection, prevention, and management of disasters [23]. Authors concluded that for a reliable, efficient, immediate (and sometimes pre-emptive) response, optimal techniques must be established and deployed over all target regions. Centralized services for information and centralized clearing houses for data must also be established, to maximize the available data for surveillance and to allow rare resources and expensive reserve capacity to be applied over many sites.

A study of Central American Network for Disaster and Health Information showed that despite the recognition that access to information is essential to disaster preparedness, inadequate information technology, lack of training for skills necessary to find and manage information, and lack of awareness about what information is available often prevent or delay access to vital information by governments, health professionals, and communities before, during, and after emergencies [12]. Another study found that the real problem in Hurricane Katrina was lack of information and information management [24]. Not enough information was shared between those at different levels: field, local EOCs, hospitals, and the state. This was caused partially by the lack of defined and practical information gathering and reporting procedures among state and local authorities. Poor communication made it difficult to put together a clear, accurate picture of the damage and what was happening at the local level. Also, there was no standard definition of certain terms such as "hospital evacuation", which could mean either moving patients out of one particular ward or total evacuation of the facility. This indicates the need for standards and protocols for communication, something that other studies highlighted too. Sandman, for instance, stated that developing protocols to handle the coordination and communication of risk and event information to the general public is an important issue and one that is often absent from the preparedness literature [25].

Two issues that recently have attracted the attention of EM officials are the role that information professionals could play in emergency planning, response, and recovery, as well as the role that information technology could play in efficiency and effectiveness of these processes [14, 26, 27].

Method

A mixed-methods (qualitative and quantitative) approach was adopted for this study. Although mixed-methods studies are time consuming, they have several advantages [28]. The validation of research data and methods through triangulation, encouragement of creativity that could

stimulate further work, expansion of the scope of the study, and more confidence in the results are among benefits of using a combination of methods [29]. This study had two parts: Semi-structured interviews and a cross-sectional survey using questionnaires. These two processes were performed by the lead author in a single period of time simultaneously.

(a) Interviews: 65 public health and therapeutic affairs managers in different levels of health organizations were interviewed. The interviews were semi-structured and conducted face-to-face by the senior author. A protocol was used for the interviews, started with asking the participants about their background, the nature of their activities, their commitment and type of activities their organization normally conducted regarding mitigation, preparedness, response and recovery. Interviews were performed in the managers' office and lasted between 20 and 78 min, averaging approximately 46 min. Prior to the tape recording of the interviews, their consent was obtained offering them the confidentiality of their identity. The majority of the interviewees agreed to record the interviews. The interviews then were transcribed. To analyze the data, the framework analysis developed by Ritchie was used [30]. To help a better analysis of the data, Atlas.ti 5.5 software, a software package designed to facilitate the analysis of qualitative data, was used. The authors coded all segments of the text and compiled themes by the codes. In the process of data analysis, the thoughts of separate interviewees were reconstructed into a meaningful category by the processes of data reduction, combining same or similar codes, and induction, identifying new meaningful ideas emerging from the gathered data. To increase the credibility of the analysis, the triangulation technique was used [5]. The result of the analysis was consulted with some of the interviewees and their comments and suggestions were considered in the final analysis.

(b) Questionnaire survey: a random sample of 230 health managers across the country was surveyed using a paper questionnaire survey. The response rate was about 50%, as 114 completed questionnaires were collected. The questionnaire included questions about information databases, hazard registration, sharing and logging information (see Appendix 1) and it used five Likert scale. After consultation with a statistician and the literature it was decided to assign a value of 1 to 5 for completely disagree, to completely agree respectively. The null hypothesis was decided to be $M > 3.50$ and one sample, one tail T-test was performed to test the hypothesis for each question. SPSS software was used for data analysis.

It must be said that the research project, investigated a range of issues related to health service management in disasters. What is presented here is only the findings related to information and communication.

Results

As stated in the literature review, the most important and vital element for any system especially for EM system is information. However, depending on the organizational level and needs, existence and sharing of information varies among organizations. At the local level the information tends to be more detailed while in regional and national levels it contains more general and fundamental information. The interviewees in this study believed there should be five different information databases for EM. These databases are: demographics; disasters; senior and line managers; hospitals and therapeutic facilities, laboratories and emergency posts; and health facilities such as health centers. Some interviewees at regional level claimed that their organizations have started to create the databases and gather data to complete the whole or some parts of these databases.

We must have five databases which are needed during disasters. One of them is a hospitals database. We must have information about all hospitals and their facilities, wards, even number of their ambulances. We have made some progress in creating this database. The second database is information of all senior managers with their names and contact details, on which we are currently working. The third database is information of all emergency posts inside or outside cities, their equipments, personnel, geographic location and other related information. The fourth database should include information on the history of disasters in the region, their frequencies, damages they have caused, disasters probability, and future possible disasters and so on. Now we are investigating the feasibility of creating such a database. And the last database is demographic information in each city, education, age, regional diseases, maternity, babies and so on. We must have for example information about mothers, number of children, elderly people, and diabetic patients and so on to help them during disasters.

Nevertheless, most of the interviewees especially at local level believed none of these databases were fully accessible or even had been created and data were fragmented and spread among different organizations. Therefore a system is needed to gather information, interlink different databases, and share the information among stakeholders.

An information structure for disasters doesn't exist. So, how can we understand to what extent there is a possibility to provide water? How diseases are controlled? Information is a great support during

emergencies. I mean a structure which includes all information i.e. the Fire Brigade maps; hospitals and number of their beds and other necessary information; gas and water pipelines....

Finding of the survey supports these statements. The respondents in the survey were exposed to the statement of ‘emergency management databases have been created’ and were asked to express their level of agreement or disagreement. Table 1 shows that the respondents rejected this statement. The respondents also believed internal and external hazards were not registered (mean=2.66, Table 1) and did not believe that they shared and communicated information about incidents to the emergency management unit (Table 1).

An important issue in the EM information system is analysis of available data in order to produce sensible information for decision making and management purposes. A senior manager explained that the current system does not have such a capability to analyze the data and produces sensible information.

The interviews also revealed that managers at local level had a different understanding of an EM information system compared to the managers at national level. While the participants in regional and national levels mainly saw an EM database preparedness perspective, the majority of managers at local level focused on the response phase and requirements that an effective information system needs to meet at this phase such as logging, informing and information broadcasting in response to disasters. The following statements by local managers describe the aforementioned issues.

Logging and recording or even presenting statistics during the first hours of disasters is very important. Many people come to get information. If you have a reliable system, tension and stress among population and their personal attendance to the health organizations is hugely reduced.

We have a communication manager for disasters. His duty is to broadcast and disseminate information

among other departments. We record all information in some standard forms and keep them even after disasters.

However, the survey results for the statement: ‘We have a formal system for logging and recording information in major incidents’ revealed that respondents (mean=2.87) believed their organizations did not have such a system (Table 1).

Appropriate broadcasting of data prevents many other problems. Some interviewees believed that using a website to broadcast information of casualties such as their photos, place of admission, and regularly updating them, psychologically relieves and reduces stress of families and relatives, and reduces unnecessary transportation and pressure on communication infrastructures.

In Kerman, when we started to organize our information, we realized that when we tell somebody for example the body of your casualty is at X hospital, he is much happier compared to not knowing

The idea of broadcasting information through a website was a lesson from Bam earthquake. During the Bam earthquake there was no cooperative and centralized policy for information broadcasting, therefore this idea was introduced into the health system. A national manager describes the issue by the following statement:

We did not have any appropriate information broadcasting system during the Bam earthquake; I mean a website which could be used to put the related information. We thought to design a website and load it on a good server with fast loading capacity which enables millions of people to visit it simultaneously.

Discussion

In Iran, there is a multitude of health organizations providing health services to the population, such as the military health sector, private health sector, and the Ministry of Health and

Table 1 Emergency information management system and the significance of the respondents’ answers

| | Total respondents | Mean | Sig. (1-tailed) P-value | SD |
|---|-------------------|------|-------------------------|------|
| Incident information is shared and communicated to the emergency management unit | 109 | 3.06 | 0.000 | 1.12 |
| All internal and external hazards which are related and important to our organizational objectives are registered | 112 | 2.66 | 0.000 | 1.17 |
| Emergency management databases have been created | 109 | 2.61 | 0.001 | 1.06 |
| Formal system for logging, and recording information has been introduced | 108 | 2.87 | 0.000 | 1.16 |

Test value was considered to be 3.50

Medical Education. Accurate information and effective communication is necessary to improve coordination between different health sectors and also international organizations such as the WHO and other UN relief organizations such as UNDRO which are concerned with international disaster relief operations [31]. The flow of information between organizations, within organizations, and from the organizations to the population is crucial. Failure here will result in an ineffective response and arbitrary allocation of resources [32]. To prevent this problem, participants proposed to create different databases at different levels to be used in preparedness, response and recovery phases of emergencies.

Data are used to improve the design, testing, and execution of disaster plans, preparedness, mitigation, coordination, and communication and the lack of data make these activities difficult. Currently, some organizations at regional level have realized the importance of such databases and started to create their own. However, this is not the case in the local organizations. Most of the required databases are not fully accessible or have not been completed or even created. While the most important and vital element for any system, especially for EM, is information, all data were insufficiently detailed, fragmented and spread among different organizations.

Different case definitions and data collection methods might be used in different organizations [6, 33, 34]. However, in order to produce sensible information for decision making and management purposes, the available data must be analyzed. The current system in Iran does not seem to have the capability to analyze the data or produce sensible information. Also, there is no formal system for logging and recording information during disasters. This finding supports the result of some previous research indicating that there was no record of patients during the response phase, and the health organizations had difficulty establishing and maintaining medical records [33]. In a university hospital in Turkey after the 1999 Marmora earthquake it was found that there were difficulties in keeping medical records of the patients, especially within the initial several hours of the disaster, due to the lack of knowledge about the patient load and the severity of the injuries [6]. Following the Loma Prieta earthquake, keeping medical records in hospitals receiving excessive numbers of victims was difficult, and records of some patients were not kept at all [34, 35, 36]. This was caused partially by lack of defined and practical information gathering and reporting procedures among state and local authorities. Other studies have also underlined the difficulty of keeping records in similar situations, as vital registration systems are not fully developed [37]. Good documentation is essential in a disaster in which medico-legal issues may arise either at the time or later [23–25, 38].

The authors suggest a system to be established in order to create standards and protocols for communication, gather information, link different databases to each other, and share the information among stakeholders. Other studies have highlighted this too [24]. For instance, the real problem in Hurricane Katrina was the lack of information and information management and lack of sharing information between different fields, local emergency operation centers, hospitals, and the state [23].

For an appropriate preparedness, and response, this system needs to be centralized [12]. Such a system would provide information technology and training in how to find and manage information, and increase awareness about what information is available by governments, health professionals, and communities before, during, and after crises [22].

The authors also suggest that for effective communication and to inform the public as fast as possible during response and to prevent future problems, a website should be created. Several other studies have also pointed out the benefits that the application of the Web and websites could have for disaster management issues [12, 22, 23].

Although, this study was related to Iran, the findings could be used for other developing countries, especially in the Middle East, where the same problems exist.

Conclusion

The current study is the first study in its kind to have been conducted in Iran. The study showed a clear lack of information strategy at both national and local levels with regard to disaster management. Lack of an EM information system, was among the main problems identified.

To improve the existing situation, the following recommendations could be made:

1. Setting an information strategy related to emergency management;
2. Creating a national networked database for emergency related information;
3. Creating protocols and standards for communication;
4. Training the staff on how to communicate with media and how to acquire appropriate information from different places;
5. And it is suggested a centre be hosted in the Ministry of Health Services and Education to centrally manage the data and share them.

Appendix 1: Questionnaire

Please indicate the extent of your agreement or disagreement with the items below (disaster=major incident).

[Five-level Likert scale was: Strongly Agree/Agree/Neutral (or I don't know)/Disagree/Strongly Disagree].

- Appropriate relationships with outside stakeholders have been established at the appropriate levels.
- Information about incidents is shared and communicated to the disaster management unit.
- All individuals within the organization know their responsibility and role response to a disaster and have been trained for that role.
- Our organization knows the responsibility of other organizations involved during disaster.
- The organization understands the concept of response escalation.
- The DMU members have practiced their roles and functions in an appropriate setting (exercise or actual incident).
- There is an explicit whole system communication strategy for use in a disaster management situation.
- We register all of hazards inside and those outside which are related and important to our organizational objectives.
- Our plans contain arrangements to communicate with relatives of casualties and personnel
- Our organization is part of multi agency plan for warning and informing the public.
- A disaster management data base has been created.
- There is coordination and management of voluntary efforts in the event of a disaster.
- We have a formal system for logging and recording information in major incident.

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