

Original Article

Patient tracking in earthquake emergency response in Iran: A qualitative study

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BACKGROUND: After a disaster, all victims have to be rapidly and accurately identified for locating, tracking and regulating them. The purpose of this study was to summarize people's experiences that how the patients were tracked in past earthquake disasters in Iran.

METHODS: A qualitative study was carried out in 2015. This was an interview-based qualitative study using content analysis. The interviewed people included physicians, nurses, emergency medical technicians, disaster managers, Red Crescent Society' first responders and managers. Participants were identified using a snow ball sampling method. Interviews were audiotaped, transcribed, coded, and entered into MAXQDA (version 10) for coding and content analysis.

RESULTS: Three main themes and seven categories including content (recoding data), function (identification of victims, identification of the deceased, informing the patients' relatives, patients' evacuation and transfer, and statistical reporting), technology (the state of using technology) were identified that showed the patient tracking status in past earthquakes in Iran.

CONCLUSION: Participants believed that to identify and register the data related to patients or the dead, no consistent action plan was available. So developing a consistent patient tracking system could overcome this issue and improve patient safety.

KEY WORDS: Patient tracking; Emergency response; Qualitative study; Earthquake

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INTRODUCTION

Natural hazards affected millions of people worldwide in 2015.^[1] In Iran natural hazards annually caused more than 3 000 deaths and 1.5 million individuals were affected in the earthquakes reported as the most serious and destructive types of natural hazards. In the past decades, Iran experienced several earthquakes in its different regions which caused heavy and non-repairable human and financial losses and damages. The number of people killed in the earthquakes was about 73 000.^[2–6] Over hundred years, there were about 181 big disasters which resulted in the death of about 160 thousand people, the injury of more than 170 thousand people, and the damage to more than 44 million people. The frequency

of earthquakes have increased considerably in the last few decades. One of these earthquakes occurred in the northern Iranian province of Gilan in 1989, resulting in the death of around 40 000 people in Roudbar. Also, in December of 2003, the Bam earthquake led to casualties of around 30–50 thousand people, and more than 300 people died in the Azerbaijan earthquake of April 2012.^[7–9] These experiences and other reports proved that health care systems are prone to challenges regarding response to disasters in the local, regional and international level, because it is accompanied by managerial, logistic, technical, and medical challenges, which were seen in the Bam earthquake, in which a large number of patients was evacuated from their homes

and transported to hospitals throughout Iran.^[10-12] Thus, documentation of patients' location and their medical condition during evacuation from the point of injury to field and referral facilities is very important both for optimizing patient care and managing the evacuation process.^[13,14] Further, this action helps hospitals' personnel to manage the patients who are arriving at the hospitals and provide necessary preparation for proper response.^[15] A consistent patient tracking process for documentation of patient information and tracking them is one of the most issues that help to decrease the health care system challenges in natural hazards.^[16] In emergency medicine, the concept of tracking has two denotations. One of the meanings refers to tracking patients' physical locations and the other refers to the improvement of patients' treatments and tracking their medical needs while providing pre-hospital and hospital emergency services.^[17,18] Patient tracking systems include three terminologies: locating, tracking and regulating systems.^[19] Currently, most of emergency services are based on paper system, whereas these services do not act appropriately in great disasters that cause information loss.^[20] Applying and implementing a system of tracking and monitoring patients may result in improving workflow and work procedures of medical teams.^[21] An ideal national patient tracking system should update the location and medical condition of patients or those who are evacuated from the disaster scene. Patients' information should be accessible for authorized users to continue their care, accommodation and transference.^[19] But collecting these data is a main challenge in response to events.^[22] Literature review showed that there are different studies in the world, some focused on content and functions of patient tracking system in disaster, and the others introduced the application of information technology for patient tracking in disaster. For example, Zhao et al^[23] conducted a study to assess a portable instrument with high efficiency for the rescuers' use in documenting victims' triage in mass-causality incidents. The first responders were able to record patients' vital signs, injuries, and triage status immediately and accurately and the patients could be transferred for continuum of care. In another research study, Gao et al^[24] developed the system for real time patients' monitoring which could provide integration of vital signs sensors, location sensors, electronic patient records and web gateway technology for remotely monitoring patients. Furthermore, a study introduced a system for making the documents of patients' electronic triage and supporting the victims tracking

process.^[25] Currently, there is no appropriate and rapid method for tracking patients and transferring victims after the occurrence of incidents in the world.^[13] In most cases, there is no accurate and sufficient information about the number of patients, their medical condition, location and transfer status, which causes ineffective response to disasters.^[16] Failure in tracking the victims of Hurricane Katrina (2005) was identified as a main weakness in local and national preparation planning for dealing with disasters.^[26] Because of absence of reliable data of patients' transference and accommodation during and days after the Bam earthquake, commanders have faced with challenges for appropriate resource allocation and victims' rescue.^[27] The absence of a system to record, collect and classify information resulted in providing unreal statistics and inappropriate decision-makings.^[28] The lack of an integrated information network in Iran's emergency medical system for registering, documentation and reporting the appropriate information and statistics^[29] was among the emphatic reasons for the present study. In addition, in Iran, there were no documented reports about patient tracking in the past earthquakes and it was not clear how the patients were tracked, what kind and source of data were collected and how such information was transferred and reported in the past earthquakes. According to the World Health Organization's report in the Bam earthquake, registration of dead and injured people was a major challenge.^[30] Hence, this study aimed to summarize key informants' experiences that how the patients were tracked with a specific emphasis on tracking of their location and medical conditions in the past earthquakes in Iran.

Ethics statement

The study was approved by the research ethics committee of Isfahan University of Medical Sciences. Prior to beginning the qualitative interviews, the participants were informed about the purpose, the voluntary nature of the interview and the anonymous interviews coding. Consent for participation and tape recording was obtained before each interview. To maintain confidentiality of responses, no individually identifiable records were kept.

METHODS

Study design and description of participants

A qualitative study was carried out in 2015. This was an interview-based qualitative study using content

analysis. The study was to explore the experiences of 24 key informant people who experienced in the past earthquakes emergency response such as Roudbar (1989), Bam (2003), Lorestan (2006) and Azerbaijan (2012). These people included physicians, nurses, emergency medical technicians, disaster managers, Red Crescent Society' first responders and managers. The sampling method was purposive and typically snowball one. With this method, the researcher selected individuals who have rich information about the research goal and are willing to participate in the study.^[31] The first people selected by simple sampling and the rest of them introduced one by one to interviewer by previously interviewed persons.^[32] Qualitative research is an interpretative and naturalistic approach. It means qualitative researcher try to study the issues in their natural situations and interpret them according to the understanding of the people.^[31] So, the qualitative approach was used in the present study because it is well appropriated to explore the experiences of the people and their deep understanding of the past earthquakes in Iran.

Data collection

The data collection tool was an interview guide including a list of general questions about the respondents and some specific questions on how they identified and tracked the patients in detail from disaster scene to final referral center in the past earthquakes, which was developed and refined after a pilot of four interviews with participants. Data collection via interview aimed to gathering the information which is not visible straightly. This manner usually searches about people motivation, practice and experiences.^[33] Data collection was started in Isfahan, then the researcher travelled to Tehran to continue the interviews with individuals. After that, because of far distant of the other cities to travel, using a good enough broadband connection at our university, the participants of Kerman, Bam and Shiraz were interviewed by Skype. The interviews continued until thematic saturation was achieved, or no new ideas surfaced from subsequent interviews.^[34] The interviews were conducted in Persian by the same interviewer, between April and September 2015 at participants' office, and each interview lasted approximately 45 minutes. Then they were audio recorded and professionally transcribed. Missing text from initial transcriptions was reviewed with the original recordings and re-transcribed by the other person of the research team, and then translated into English.

Data analysis

In this study while the data were gathering, researchers began to analyze the interview documents. So, data were transcribed from the interviews. Each Persian transcript before translation was read and independently coded through thematic analysis by the researchers, also coded by another member of the research team with expertise in qualitative methods, for extracting the main themes at the same time of making the interviews. Codes were revised, added, and deleted as progressing through the transcripts. The primary author reviewed all transcripts after the final coding structure was established to ensure that all quotes were coded consistently. Then we used key themes, or recurrent and unifying ideas to characterize participants' views about patient tracking status. As recommended by experts^[34] in this study, for data reliability and validity it was conducted participant conformation, in which findings were verified with representatives of participants. There were no discrepancies. Maxqda 10 (VERBI Software.Consult.Sozial forschung GmbH, Germany) was applied for coding and content analysis.

RESULTS

All participants were male ranging in age from 35 to 59 years and with experiences in earthquake emergency response. Most participants held MSc and the length of their work experience were higher than 15 years.

Analyzing participants' experiences resulted in the extraction of three main themes and seven categories including content (recoding data), function (identification of victims, identification of the deceased, informing the patients' relative (s), patients' evacuation and transfer, and statistical reporting), technology (the state of using technology) (Figure 1).

Theme 1. Content of patient tracking system Status of recording patients' data

All participants declared that there was no regular process for recording data and rarely in some events, triage forms were completed with insufficient information.

One of the participants who had the experience of different earthquake response stated that: "...in the Bam Earthquake, there was no card at the scene for recording patients' information. We had information of only those patients who were hospitalized in Kerman Hospital, because the damaged region had no facilities for registering patients in the first week." (Interview 10)

In another interview, the participant stated that:

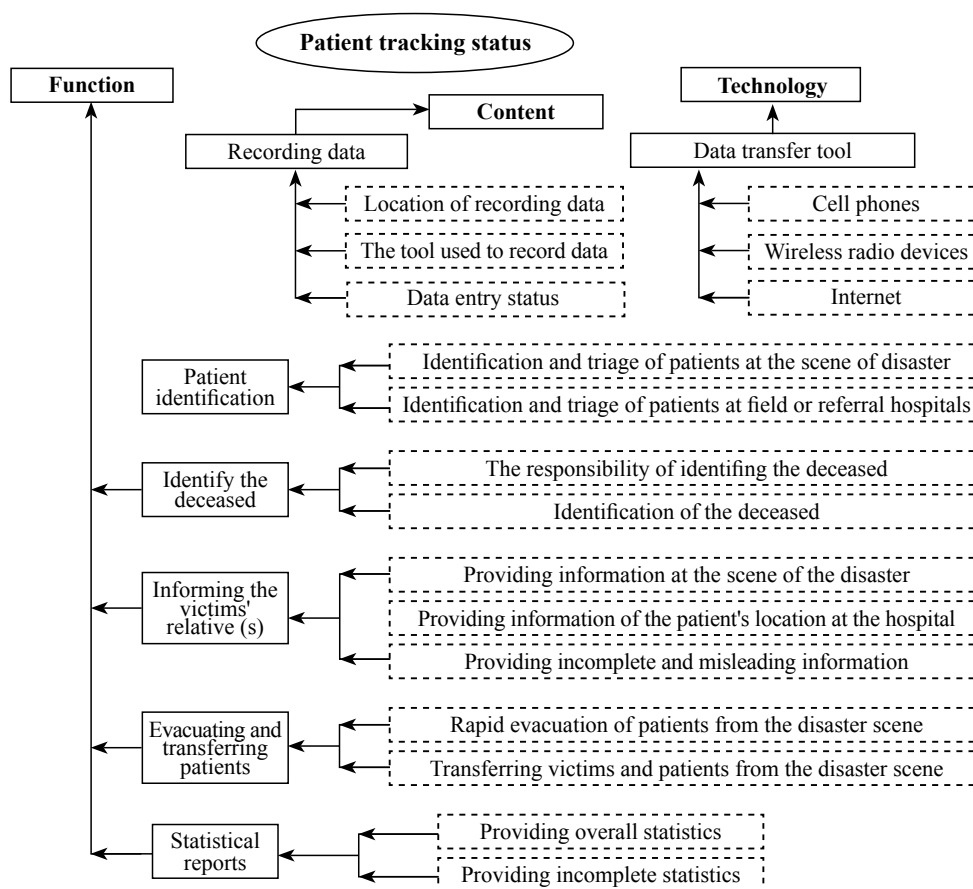


Figure 1. Diagram of participants' experiences in past earthquakes emergency response in Iran.

"There was no documentation accompanied patients when I transferred them from disaster scene to the airport, even there was no information with a group of victims who were transferred to Tehran. Nothing was recorded, nothing." (Interview 19)

Another participant with many experiences of emergency response to different earthquakes described his experience as follows: "In the Roudbar earthquake, the information about unconscious victims could not be recorded and they only received life-saving services and transferred to the field hospital. The regular registration system was not subjective. In Azerbaijan, our experience was different. The pre-hospital system worked well. All patients were labeled, registered, and recorded with their complete specifications, and then, were transferred to hospitals." (Interview 15)

Theme 2 Function of patient tracking Patients' identification

Participants' statements indicated that in the past earthquakes, patients were neither triaged nor received any identification tags at the scene of a disaster.

One of the participants stated about his experience in the Bam Earthquake (2003) as: "It is a routine manner to tag the patients, but in Iran, it has not been conventionalized. In the Bam earthquake as well as in other disasters, this issue was not fulfilled. Usually, no identification or triage tag was used and in current situations, it is not used as well." (Interview 2)

Most participants stated that triaging and identifying the patients are mostly observed in maneuvers and at the scene of disasters, they are not used realistically.

A participant who had multiple experiences in different emergency response in Iran stated that: "No accurate triage was conducted in a real and systematic way, and triage was conducted based on the judgment by appearance of individuals who had experiences. I rarely observed that triage was done in the field. Field triage was conducted only in maneuvers, but in a real disaster scene, they were scarcely observed." (Interview 14)

Two other participants described the state of patient identification in the Bam Earthquake as follows: "I was the representative of the Ministry of Health in Bam. There was no system to identify those patients who were

transferred. In fact there was nothing under the name of patient identification in Bam." (Interview 16)

"Patients received no particular identification. We only could ask patients' or their relative's names. We had no information of the victims who were evacuated from the scene of disaster, and nothing was registered about them." (Interview 17)

According to participants' statements, in some cases, after evacuation of patients from the scene of disaster in collection points, field hospitals or next health care facilities to which patients are to be transferred, triage and identification has been conducted.

Identifying the deceased

Regarding identifying the deceased, participants declared that they had no enough time to identification and medical forensic was responsible for that.

One of the participants described his experiences in the Bam Earthquake as follows: "We had to look after just the victims because the number of the deceased was high and we had no time to tend the dead. The deceased mainly were tended by their families. (Interview 5)

"There was no identification of names for the deceased. I want to tell a bitter memory of a family of which 26 members had been lost and none of them could not be identified. Therefore, a canal had been caved and they were buried there. After two weeks, the specialist forensic lab was set up and it was started to deceased identification." (Interview 13)

Informing the patients' relative(s)

Most participants declared that they had no sufficient information of patients to give their relatives about their location and state.

In answering the question that how they guide patients' relatives for unifying their families, one of the participants stated that "If the patient was conscious and he/she could give us his/her name and other characteristics, we wrote them down; also, we asked which zone he/she had been found by first responders? And when the relatives were referred to get information, we might be possible to inform them?" (Interview 1)

Another participants stated that "... when we were at earthquake scene, the status was in such a way that all officials were mixed up. Relatives and I were mixed up and we could not help them appropriately to find their victims." (Interview 19)

Another participant described his experience of the Bam Earthquake as follows: "That was a big tragedy when relatives were referred to us and asked where

were their victims, there was no reference to tell them that we had referred them to code 1 for example. The main reference was Kerman and they had to ask Kerman hospitals to help them." (Interview13)

Evacuating and transferring of victims

According to ideas of participants in the past earthquakes such as the Bam Earthquake, evacuating victims rapidly from the scene of the disaster and transferring them were important measures:

One of the participants stated that "At 4 o'clock, we arrived at Bam Airport, but remained in the airplane. There were a lot of victims gathering near the runway so that we only had time to transfer 120 victims who were in the airplane, braced them up, and injected serums." (Interview 18)

"The only thing we could do at the first night was that we gathered ambulances which came to the scene and run the transport system. You know that usually in emergency, we have four Ts: time, triage, transport, and treatment. I can say that only transport was conducted appropriately." (Interview 16)

Statistical report

According to participants' ideas, no comprehensive, systematic, or written statistical report of disaster scene and patients' transference was provided. One of the participants stated that "Only general statistical data were registered in the headquarters of the region which had several dispatches. Statistical data were oral." (Interview 2)

Another participant stated about the declaration of the statistics from different resources that "There was no specific statistics and reporting, everyone provided his own report. But they were incorrect, for example, the Red Crescent reported its relief statistics, emergency medical services authority had its own relief statistics, hospitals had its own statistics about treatment. All had their own statistics which were overlapped." (Interview 17)

Two other participants stated about the improvement of reporting and providing statistics after the Bam disaster that "... in the following earthquakes such as Azerbaijan, we had daily reports. We owned forms according to which reports were provided about how many people had been injured? How many patients had been visited? What procedures had been provided for them?" (Interview 17)

"In Azerbaijan, reporting was excellent and all things were registered. It means that the pre-hospital system should be reported to hospitals and the emergency operation center which should be reported at the end of each shift." (Interview 15)

Theme 3 Using technology for patient tracking

According to participants' ideas, no technology, except wireless radio devices, was used in the past earthquakes.

One of the participants stated that "We had only the emergency wireless radio devices." (Interview 15)

Regarding recording the data and reports, one of the participants stated that "We did not have any specific technology, all tasks were done manually." (Interview 17)

Another participant stated that: "In Azerbaijan, wireless radio devices were the mostly used technology, but if it was needed, cell phones and the Internet were available. In Azerbaijan, the situation was very different from the Bam Earthquake. Gradually, after the Bam Earthquake, devices were adapted for appropriate use." (Interview 12)

DISCUSSION

In present study, we focused on the patient tracking situation of past earthquakes emergency response in Iran. The key elements of patient tracking are tracking location and health status of patients.^[19] We found that, in most earthquakes, there was neither a regular and common procedure for tracking patients nor consistent action plan was available to identify the patients and register their demographic and medical data. Thus, this resulted in the lack of exchanging information about the medical status of patients at or out of the scene of disasters and in most cases this information was not transferred to the next medical team or medical center, leading to non-appropriate patients' evaluation. Rathore et al^[35] found important barriers in dealing with timely and effectively victims' problems such as the lack of a regular system of data collection, and declared that after the Bam Earthquake, due to the insufficient information about patients, their effective patient management and evaluation were problematic. In addition, Kook and Das^[36] found deficiency in tracking patients of Hurricane Katrina (2005) in the USA was a weakness in the local and national preparation programs of coping with such events.

Regarding the number of patients and evacuees from the scene of the disaster and the deceased, participants stated that the reported data were general and unrealistic because different authorities at the scene such as the emergency medical services (EMS), the Red Crescent, medical forensic, and police presented inconsistent data of their own activities. Therefore, real documents and reports of number and medical status of patients and the deceased were not available. Bengtsson et al^[13] reported that after the Haiti earthquake (2010), no appropriate and rapid method was available for tracking patients

and transferring them and, transference of victims and evacuees was controlled only by a rule of thumb or satellite images of shelters and registering patients in field hospitals. However, these methods were very slow and inappropriate for registering changes in patients' status. In the Bam earthquake, Raeisi^[37] found that even months after the occurrence of the disaster, the real number of individuals who had become disabled was not identified. According to the report of Iran's Emergency Operations Center in 2010, neither comprehensive system was available in Iran for registering documents, statistics, and information appropriate for the victims in the past decades (particularly the Bam earthquake) nor patients' problems and the type of their injuries.^[29]

In the present study, participants declared the lack of appropriate transference of patients to medical centers and no appropriate response to patients' relatives for finding their patients. Survey on managers of the Red Crescent relief operations in the East Azerbaijan earthquake in 2012 of indicated that some operations including the mode of prioritizing victims and their transference were inappropriate.^[38] The present study showed the similar result.

In participants' suggestions for improving the status of patient tracking as well as the use of electronic health record (EHR) and national code can be more useful. Dobson et al^[39] investigated tracking systems in the pediatric emergency department in an attempt to enhance the use of technologies in electronic tracking. He suggested that using tracking technologies for clinical applications and improving the care of emergency patients should be enhanced, and the use of best technologies can promote the management and tracking emergency patients and improve patient safety. Participants' suggestion for improving patient tracking using technology in the present study was emphasized.

This study showed that there was neither proper process for recording of patient data and use of triage tags and triage forms nor sufficient information of patients to give their relatives about their location and medical status. Moreover, there were no real time and reliable statistical reports of patients transferring to different referral hospitals.

Ardalan et al^[40] reported that many important disaster management measures were taken by the Ministry of Health after the Bam earthquake such as developing the guideline of Disease Surveillance in Disasters in other disasters. Close collaboration between different partners, environmental health and disease control, developing the guidelines for Reproductive

Health and Nutrition in emergencies, and promotion of triage and evacuation protocol training and education initiated the community-based disaster management programs to reduce the risk of disasters. Despite of all effective and valuable achievements, the importance of patient tracking during a disaster was not defined and considered. Hence, the lessons learned of this interview-based study included necessity of developing electronic health record systems (EHRS) for patient care even during the disaster that health care providers were able to use these systems to access the existing medical records for the population to support optimal care at the scene and hospitals, necessity of developing an integrated information system to promote the patient safety and better communication between disaster scene, responsible agencies and hospitals in order to collect accurate and consistent information of patients and evacuees, and assign a unified code to each family for reunifying them after disaster.

CONCLUSION

This study was based on interviews from the people who had experiences in earthquake emergency response in Iran. We focused on the status of patient tracking including patients' identification, registration, medical and administrative documentation and tracking the location and health status of patients or those who are evacuated from the scene. In conclusion, the findings of this study added to the lessons learnt of earthquake response in Iran, to the health system, Red Crescent, Emergency Medical Services and government, to take measures for developing a national patient tracking system in preparation plan in Iran. So that, in earthquake emergency response, the patients' location and health status could be tracked effectively from disaster field to final care facilities destination, and the family reunification could be done after earthquake immediately as a humanitarian action.

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Contributors: All authors contributed in designing the study, analyzing the results and preparing and editing the paper.

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