

# Challenges of Hospital Incident Command System (HICS) from Experts' Perspectives: A Qualitative Research

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## Abstract

**Background:** Hospital Incident Command System (HICS) is one of the most valid incident command systems for preparing and increasing efficiency of hospitals. With regard to hospitals' key roles in Medical Incident Management, the present study aims at obtaining experts' ideas for investigating challenges of establishment of HICS in Iran's hospitals. **Methodology:** The present study is qualitative one conducted via the semi-structured interviewing method. Interviews were conducted on 23 experts selected from HICS in the Medical University, Red Crescent Society and Social Security Organization in 2016 so that after recording each interview, they were transcribed and, then, the raw data were reduced and organized via the content analysis technique. **Results:** According to findings of the present study, since the HICS is established based on the principles that ensure the effective deployment of resources on one hand and decrease the disorder in policy making and the operations of responding organizations, on the other hand, the point of view of most participants in this study showed that the HICS in Iran is not implemented properly. The studies showed that consistency of this system with existing management structure in hospitals cause internal and external barriers to its implementation. **Conclusion:** Based on the present results, the most important cases causing inefficiency of HICS in Iran are as follows: complete lack of understanding of HICS's components and features, lack of adequate training of the staff, and lack of localization HICS in Iran. Thus, appropriate planning, necessary intra-and inter-organizational coordination in incidents, reinforcement of forces by appropriately organizing them, supply of required training, suggestion of long-term strategies, and finally design of a HICS by applying components of the Quality Management System with regard to conditions in Iran seem necessary.

**Keywords:** Challenges, Hospital Incident Command System (HICS), Qualitative Research, Semi-Structured Interview

## 1. Introduction

Unexpected events have always threatened human societies. During the past decade, the need for preparedness in cases crisis and emergency has been as one of the main issues of public opinion<sup>1,2</sup>. In 2014, according to international statistics, 324 natural disasters occurred which killed more than 7823 people. Meanwhile, Asia has the largest number of incidents (44.4%) and the highest numbers of victims were (69.5%)<sup>3</sup>. About 1.828 million people have been affected by natural disasters in the last six years in Iran<sup>4</sup>. What happens after these incidents is an unpredictable chaos and the hospitals are involved in reception of the injured after accidents<sup>5</sup>. In fact, the damage caused

by disasters harm to society. Therefore, hospitals should be the first reference of the health care system which is fully prepared for disasters<sup>6</sup>. It is important to note that hospitals dysfunction does not take place only as a result of physical damage. On the other hand, lack of preparedness of medical center can lead to consequences including the loss of capabilities and resources of the society to manage and cope with incidents<sup>7</sup>, and likelihood of confusion, poor service delivery and ultimately, failure to meet the needs of victims<sup>8</sup>.

Hospital destruction would lead to sense of insecurity in the absence of alternative standards and facilities. This requires effective management in disasters including planning and preparedness before the occurrence of

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events as well as effective response<sup>9,10</sup>. Hospital Incident Command System is one of the most reliable Unexpected Situations Command Systems to prepare and increase the efficiency of hospitals<sup>11</sup>. In the late 1980s, the principles of the Incident Command System were recognized for hospitals with nearly 25 years of experience in using the Hospital Incident Command System in America and other countries, and its revision process became possible in 2014<sup>12</sup>. HICS can provide response to all events regardless of scope, geographical conditions and structure and the system strengthens coordination and communication between various health organizations and offer health during the crisis<sup>13</sup>. The system should prepare the hospital staff to manage the events inside and outside the hospital, and to facilitate the intra- and inter-sectoral collaboration with other institutions<sup>14</sup>. The most important objectives of applying HICS include timely response to the incident, security of the responders, management of incidents, and ensuring the efficient and optimal use of resources<sup>15</sup>.

In the study of Schoenthal entitled "a case study in identification of critical criteria in successful application of HICS" the results of the review showed that the existence of teamwork, as the main component in this system, is the reason for success in the system (11). Study of Djalali et al. entitled "Hospital incident command system performance in Iran" showed that application of the modified model enhanced the performance of hospitals in disaster management<sup>16,17</sup>. Studies conducted on the preparedness of hospitals to respond incidents in order to deploy Unexpected Disaster Command System revealed that none of the hospitals of the university had fully deployed the system, and the activities carried out in this regard were incomplete (10). Large-scale damage caused by natural disasters and incidents in the world led to carrying out applied-executive researches in the field of crisis management and application of Incident Command System.

Given that the area of health which is considered as the first and most important place among all elements involved in Disaster Management requires proper functioning of the Hospital Incident Command System, proper planning, training, identifying capabilities and limitations contained in it is of significant importance; in this respect, identifying and applying standards of Command System plays a major role. For this purpose, in this study, the effect of Incident Command System in the health care system (hospitals) was examined from experts' opinions.

## 2. Methodology

### 2.1 Study Design and Research Population

This study aims to achieve experts' opinions on the impact of deployment of HICS. For this purpose, qualitative method was adopted using content analysis method in a nine-month period in 2016. The information source populations in this study were selected from knowledgeable individuals in medical universities, Baqiyatallah, Red Crescent Society, Emergency Center and Social Security Organization.

### 2.2 Selection and Description of Participants

There were 23 participants from different cities in Tehran, Isfahan, Qom, and Kerman in Iran, who met the inclusion criteria. The individuals in the above cities were selected according to management and work experience in this regard, experience of occurrence of unexpected disasters, rich information on this topic, interest in the provision of information and experiences. Exclusion criteria included lack of willingness to cooperate at every stage of research, or altered responses. In this study, target-based sampling began according to the importance of deep examination of the experiences of knowledgeable individuals, and the other individuals were then added by the snowball method. Then, sampling continued by confirmatory and rebutter samples method rule to the individuals' saturation stage (17).

### 2.3 Data collection

The data in this study were gathered semi-structured and individual in-depth interviews based on open-ended questions, including demographic characteristics form, interview questions, and informed consent form. For this purpose, one of the informants was the first person who was interviewed as pilot in Kerman, and he was present in the Bam earthquake, in order to extract the possible flaws. Then, minor changes were made in the interview questions based on the results, and the interview was done with 15 questions. The interview process was conducted through a formal interview with the prior agreement in the participants' working environment; the interviews were recorded with their consent, and then typed word by word by a member of the research group. The average duration of the interview was about 44.5 minutes.

## 2.4 Data Analysis

In order to analyze qualitative data in this study, the researcher used the conventional qualitative content analysis method inductively to gain a rich understanding and describe the phenomenon. The qualitative data analysis steps included determination of analysis content in which all interviews were conducted in accordance with the objectives and the question of the research. The next step was definition of analysis and coding unit where the researcher converted the data obtained from the expressions to manageable sections as primary codes. Then, the researcher compared and grouped them into two or more classes. Then, comparing the codes, similarities and differences in the concepts were extracted and a kind of integration was created on similar topics. In this way, themes were extracted and main classes were formed. In the last step, in order to form the theme of the obtained data, a consensus was reached. Then, the main themes were extracted. Written informed consent was taken from the participants to observe the moral considerations. In order to ensure the reliability of findings, after the individual interview and verification of the results, the typed information was sent to five of the participants and their opinions were reviewed again and necessary changes were made in the interviews. In addition, the interviews were terminated through reviewing manuscripts and ensuring the completeness of the text in terms of content by the participants in this study. In this way, the credibility and acceptability of the data were increased. For verifiability, the codes were aggregated, and were sent to two faculty members of medical universities who were thoroughly familiar with qualitative research. Finally, the members achieved an agreement respecting impartiality on codes and classes, as well as examining the extracted codes and classes.

## 3. Results

Findings showed that the average age of the participants in the study was 45.13 years and that about 91% of them were male. About 61% of participants were studying at PhD course and only about 22% had a bachelor's degree. In terms of administrative records, 30.5% of the respondents had management experiences and nature of 83% of their works was therapeutic. In Table 1, themes, main classes and sub-classes are displayed. Accordingly, sub-classes were made in the form of 24 classes. The number of primary classes were 9, and 5 themes were created at last.

## 3.1 Deployment of HICS

One of the main classes extracted from findings of the implementation of HICS was the way of deployment of the system. According to the experiences and views of a small number of participants, "the model simulation was possible by changing some modules in hospital, and their experiences were acceptable only in two hospitals of Tehran and Ahvaz" (P21). One of the participants said "this Command System is a set of organizational structures, programs, guidelines and resources" (p7). In contrast to these people, the views of the most participants showed that the HICS does not have proper functionality. Of the most important causes are the "credit limit" (P10) and "lack of national package approved by the Ministry of Health" (P3). One of the participants said "validation guidelines and standards focus on this matter; however, HICS is not fully implemented in Iran" (p4).

## 3.2 Meeting the requirements of HICS

Based on the participants' experiences, there are regulations in hospitals in order to meet the requirements of HICS including requirements for validation. In this regard, one of the participants expressed that "the model we use now is based on model validation" (P4). In fact, our framework is a validation that is obliged by the ministry for hospitals; and hospital activities has an axis that reviews the crisis management" (P5). According to the participants, meeting the requirements of the system can be conducted through modeling from organizational guidelines or books" (P20).

## 3.3 Design and Development of HICS based on Standard Structure

This class focuses on the conditions that determine the fulfillment of expectations in design and development based on structure, processes and outcome. One of the sub-classes is process standard which includes care, service, or management. Participants stated that "hospital crisis management processes are designed and developed, and systems, processes and flowcharts are specified" (p12). Another participant said "in this section, we analyze the risk through contingency planning, and select the prioritized cases, then, preventive strategies will be identified" (p19).

The second sub-class in this category is related to structural standards. These standards are the cases which

**Table 1.** Themes, main classes, and sub-classes extracted from the qualitative part of the study

Theme	Main classes	Sub-classes
1. Achievements resulting from the implementation of HICS	1. Deployment of HICS	1. Presence of HICS
		2. Lack of implementation of the HICS
	2. Meeting the requirements of HICS	3. Organizational requirements
		4. Modeling from books and instructions
		5. Process standards
	3. Design and development of HICS based on the standard structure	6. Structural standards
		7. Consequential standards
2. Dimensions influenced by HICS	4. Crisis management cycle in HICS	8. Phases of risk reduction and prevention
		9. Preparation phases
		10. The phases of response and evaluation
		11. Recovery phases
	5. Characteristics of HICS	12. The benefits of utilizing the HICS
		13. Defects in application of HICS
		14. Barriers to preventing the establishment
3. Strategies and priorities	6. Vulnerability assessment based on hospitals safety index	15. Functional dimension
		16. Structural elements
		17. Non-structural elements
	7. Importance and necessity of HICS	18. Training and preparation
		19. Command and control
		20. Localization
4. The models of quality improvement in health centers	8. Qualitative elements of the QMS resulting from establishment of QMS	21. The positive achievements of the establishment of QMS
		22. Limitations resulting from the establishment of QMS
5. Suitable pattern of HICS	9. Process management and quality improvement	23. Using QMS components and the relationship between them
		24. The relationship between HICA and QMS models

enable service delivery such as human, financial and physical resources. According to the views of the participants, the most important changes in the “design of crisis management structure at the university and hospital” (P14) can be “call for manpower, building organizational structure in the hospital, training personnel and material resources (P1). The last sub-class in this section is outcome standard. This standard reflects the results of the work that we do with the resources available. Based on the experiences of most of the participants “in many cases, the consequential standards at this stage did not cause significant changes in the results” (P10). Despite the change in knowledge and skills of personnel, no change has been made in their attitudes”(P21).

### 3.4 Crisis Management Cycle in HICS

This class consists of four sub-classes including risk reduction and prevention, preparedness, response and assessment and finally, recovery phases. One participant described the situation of risk reductions follows: “we can use different methods, such as risk assessment methods in crisis management, as a tool for the prevention of accidents before they occur” (P12). The most important points mentioned by the participants were risk identification and assessment. In the preparedness phases, the most important concepts were: “staff empowerment” (P2), “codified and mandating programs, creating operation system structure and human resource management” (P3). At these phases, participants introduced concepts



such as understanding tasks, planning and regulation as parts of the preparedness phase. The third phase after collecting the participants' views was the phase of response. Concepts derived from the experts' opinions at these phases were "continuing care services, taking the necessary measures in time of the incident, accountability and coordination inside and outside the organization" (P18). According to the views of a handful of participants who had experience of presence in incidents, the concepts extracted in recovery phases included: Coordination with some related institutions, providing emergency accommodation, welfare and safety of staff and patients. "One participant stated: after Bam earthquake, hospitals were not ready, when patients were discharged, there were no shelter for them, tired staff needed to strengthen their mental power, there were no alternative forces, we did not know where to transfer the patients after partial recovery. We used the experience we got in Bam earthquake." (P1)

### 3.5 Characteristics of HICS

Statements of the participants about the characteristics of the HICS showed that there were three characteristics including the benefits, drawbacks and barriers to the implementation of HICS. According to the participants, benefits of use of the system were "increasing the level of preparedness in the incidents based on the assessments carried out, determining the place and role of individuals and preventing the stop of services when the incident occurs" (P9), modifying processes, regulating the affairs and creating a written task description" (P16). However, according to experts, there were some shortcomings in the implementation of the HICS in Iran. The most deficiencies examined from the perspective of participants which lead to lack of full implementation of the system, were "lack of Standard Command System at the community level, lack of managers' awareness, defect in the chart created, and absence of comprehensive, complete education and incompleteness of duties description" (P11). In this regard, one of the participants contended "we have deficiencies in implementation of HICS, including structure, simulation and discussion of consequences, plans, and instructions as well as skilled workers that are the deficiencies of the work" (P23). Based on the experts' opinions, barriers to establishment of a HICS were lack of prediction of enough credit for crisis management, lack of resources and facilities, changes in senior managers, overlapping of administrative and financial rules and lack of

information record system" (P22). One of the participants believed that "major inconsistencies that exist between the system and the state of our hospitals is attributed to non-compliance of rules and regulations in systems and social, bureaucracy and administrative culture." (P13)

### 3.6 Vulnerability Assessment based on Hospital Safety Index

Functional dimensions, structural and non-structural elements of the groups under study rein this class. Functional dimension shows the primary measures of safety assessment, to enable hospitals which would have quick response when coping with crises. The majority of participants believed that "Hospital vulnerability assessment in this dimension is proper when compared with the crisis, and less measures have been taken in two structural and non-structural dimensions" (P17). However, based on the points accumulated from structural elements, in this axis, majority of the participants believed that hospitals did not have suitable activities in this area. One of the participants stated "Given that there are some changes in hospital structure, and according to experts, although some problems are solved, some are added to the structural problems and this can create accident and crisis for you" (P5). Accordingly, the major measures in the non-structural elements were: strengthening operations, immunizing equipment" (P15).

### 3.7 Importance and Necessity of HICS

According to the participants' statements based on their experiences, the class is divided into sub-axes including training and preparation, command and control and localization. The most important participants' points of view regarding preparedness and training were training concepts and repetition, maneuver, use of scientific and specialist experts and exercise.

"I think we work well on the staff preparedness, the staff are trained and are faced with real situations" (P6). However, one of the participants believed that "there is no appropriate training courses for this" (P20). With regard group command and control, some experts believed that the implementation of system requires leadership, command and control in the hospital: "each organization has a crisis management for itself, but there is a real need for leadership and management, and it should be focused" (P9). About localization of the HICS, the major-

ity of participants believed that “using other patterns without regard to the country’s needs do not have the necessary effects.” (P11)

### 3.8 Qualitative Elements of the Quality Management System Resulting from System Establishment

This main class was aggregated based on the views of participants, and it examined the achievements and limitations of the establishment of quality models selected in health centers. Some positive achievements of QMS establishment in health centers, according to participants, were “training employees, paying attention to the society, creating a process approach, action plans, paying attention to innovation and putting emphasis on performance management” (P17). “Paying attention to the centrality of patient safety in hospitals, creating an incentive mechanism and managing the risk and error, consistency with the risk management system and occupational safety” (p8). However, according to another participant, “it increases documentation that is not consistent with our culture” (p15). The cost of its establishment is high, lack of organization in the hospitals, competitiveness of the certificate and rising expectations of employees and customers are of its limitations.” (P14).

### 3.9 Process Management and Quality Improvement

The most important themes in this class included “the use of components of the QMS, strategic plan, training along with effectiveness, training needs assessment, monitoring and analysis of key indicators (P20), preparation through the maneuver, using registration system, documentation control system” (P16). In this regard, the experts stated that “assessment of the HICS in our country is not clear, it is not mandatory and it has a minor score in the accreditation (P18). “It is important that we have a review on the external audits and systems to promote the preparedness” (P11). The relationship between HICS and quality management models was evaluated at the last class of this group based on the views of the participants. Based on the views of a limited number of participants, “using the QMS in Incident Command System was identified as the confounders in hospitals which led to failure to fully understand each of the systems, more attention to satisfaction of employees and customers, and less attention to

the consequences of the crisis” (P19). In this regard, most experts believed that QMS and incident command system had overlaps with some of the main elements and that both move in the same direction. According to these people, “QMS will reinforce the Incident Command System through the use of qualitative elements and implementation of the system” (P2).

## 4. Discussion

The outcome of this study is obtaining five main themes including achievements resulting from the implementation of HICS, the dimensions influenced by HICS, strategies and priorities, models improving quality in health centers and appropriate pattern of HICS. The HICS is established based on the principles that ensure the effective deployment of resources, on one hand, and decrease the disorder in policy making and the operations of responding organizations (12), on the other hand. In this sense, the point of view of most of the participants in this study showed that the HICS in Iran is not implemented properly. The analyses showed that consistency of this system with existing management structure in hospitals caused internal and external barriers to its implementation (10). Further more comfort in his study stated the failure to understand the system objectives and the soul governing it, inflexibility and difficulty of activation as factors that lead to failure of proper implementation of the system<sup>18</sup>.

Findings of some other studies which have so far been conducted are consistent with those of the present study in terms of implementation of HICS. One of the reasons for failure to meet the requirements of the HICS in Iran is the lack of planning for incident management in hospitals (16). In this regard, proper planning is one of the requirements for Incident Command System<sup>19</sup>. Results of two recent studies are consistent with those obtained in the current study in terms of meeting the system requirements. According to the statements of interviewed people and themes, design and development of HICS are possible based on structural, process and outcome and standard. In this regard, in order to assess, control, and improve the quality of health care systems, Donabedian approach is proposed and it includes three dimensions of structure, process and outcome<sup>20</sup>.

Studied conducted by Roger et al. also showed that quality assessment in hospitals will be inefficient with-

out the use of standards of process, consequence and structure<sup>21</sup>. This study is consistent in terms of creation of the nature of the standard in the model according to Donabedian model. In this study, the experts believed that the crisis management cycle should be completed in the phases of risk reduction and prevention, preparedness, response and recovery. Most studies conducted in Iran have been done on the preparedness of hospitals when coping with disasters and incidents. Salari examined the preparedness against natural disasters in fifteen hospitals in Iran. Results showed that there was an average preparedness in hospitals and there was no significant relationship between the type of hospital and disaster preparedness<sup>22</sup>. In a study in Romania, a comprehensive model was presented for crisis management including a decision-making system. It focused on the preventive measures, improvement opportunities, risk reduction and risk assessment; in this regard, it is consistent with that of the current study<sup>23</sup>.

The results of the research conducted on the benefits of the use of HICS showed that the system created preparedness in medical facilities, communications and resource sharing between organizations and health care institutions (11) and teamwork increased the preparedness of manpower against disaster<sup>24</sup>. Moreover, other studies on the administrative barriers and constraints showed that high cost of implementation, lack of legal requirements, different needs of hospital users in international levels with different economic and social dimensions (10) and lack of accepted methodology to evaluate the system<sup>25</sup>. This system was unable to operate all the practical measures and the necessary plans for assisting wounded people in the response phases. In a study related to vulnerability assessment, Bajow paid attention to prevention of structural and non-structural dimensions as a preventive measure (6). This study is also consistent with current study in terms of insufficient attention to structural and non-structural dimensions.

The studies conducted on the performance evaluation showed that there is no international standard and accepted methodology in Incident Command System for evaluating the performance. This weakens the performance of evaluation of the services provided in disasters<sup>26</sup>. This study is not consistent with the present study in terms of attention to the functional dimensions. Such studies concerned the importance and necessity of HICS valued in training, command and control and localization of the model.

According to the studies conducted, attention to organizational knowledge and training courses are repeatedly expressed in studies. The main findings of the study were the need to changes in staff's attitudes through effective operational training and exercises and creation of required maneuvers<sup>27</sup>. Zane also stated the presence of proper knowledge and understanding of the Incident Command System as the requirement of the system establishment. In this regard, we can refer to the suggestions including providing necessary trainings, simulations and measures such as maneuver and training the members of the crisis committee<sup>19</sup> and conducting a research to state a deeper knowledge and view at the system in the future. However, the results of the studies have investigated the training and awareness at all levels necessary for the creation of a common language and culture.

Therefore, the need for training programs in the field of crisis management and consistent and effective implementation of them should be considered as a priority. The importance of leadership, command and control in the system is considered as a provider when responding to incidents<sup>11,16</sup>. However, what seems essential is the importance of the role of management and leadership as an integral part of one another. According to the literature on Incident Command System in which the interviews were done with senior executives in some cases<sup>28</sup> and, attention to the leadership role in the hospital management in disasters<sup>25</sup>, and leadership commitment as the main parts of HICS were examined for successful implementation of this model<sup>11</sup>.

Some other studies have shown that attention to the role of leadership and management as two inseparable parts is necessary to establish Incident Command System, and the studies conducted are consistent with the current study. According to the findings of the research, creating a specific and native model in Iran is one of the ways to meet the requirements of the system<sup>10</sup>.

Other researchers conducted also considered it necessary to create a modified model to increase the functionality of hospital when disasters occur.

From the participants' perspective, the proposed models of quality improvement in health care system had positive achievements and limitations. The possibility of establishing new standards of assessment process, outcome and structure instead of the traditional standards in hospitals<sup>29</sup> are of the studies on the positive achievements. It is a method to measure the performance of evaluation

possibility and self-assessment approaches in the health sector<sup>30</sup> and <sup>31</sup>.

However, a study in Netherlands reported that despite the development of quality improvement activities cycle in hospitals under study, only a small number of hospitals implemented the qualitative management system<sup>32</sup>. Given that most researches showed an increase in satisfaction, performance, and efficiency of the organizational learning, it is essential to note that implementation of quality models should enhance the quality of the treatment, management and support processes. Based on general views of the participants, the relationship between HICS and quality improvement models would be possible through the implementation of quality management components. The study conducted by Djalali on the modification of organizational chart of HICS including the addition of quality control officer to command group and integration of the planning department with administrative/financial unit (16) is among the studies which is associated with the use of components of the quality management system, as well as the need to train managers and their staff awareness, providing indexes related to Incident Command System and planning (10), and providing a specific process for the system and consistent implementation of them as a priority (11).

## 5. Conclusion

According to the theoretical fundamentals and literature, outcome of all the studies conducted so far showed that preparedness of hospitals in Iran against disasters was not desirable, and so, reviews and actions taken regarding the Incident Command System were sporadic and unorganized. In most of the researches conducted in Iran, limitations of the study were not considered; the most important cases that caused in efficiency of this system in Iran were: the focus of hospitals intended in crisis management in unexpected events on the guidelines and documentations of the unexpected events organization system, lack of full understanding of the system components and features and stages of execution, lack of adequate training for staff, lack of employee's motivation and involvement, lack of native Incident Command System in Iran, lack of expert force familiar with crisis management in the health centers, and the lack of strong organizational requirements. However, most of the studies were related to pre-crisis conditions in Iran and prepared-

ness level. As a result of these problems and numerous other defects, incidents and disasters of all types and sizes were often not well-managed, leading to the imposition of multiple damages in the area of health, unnecessary harms, ineffective resource management, and economic losses. Therefore, necessity of proper planning, prioritization of policies and activities, creation of the necessary coordination inside and outside the organization at events, reinforcement of forces with proper organization, providing the necessary trainings, long-term strategies, and finally, designing the Hospital Incident Command System were considered necessary for the current situation in Iran.

## References

1. Brunsma D, Picou JS. A special section disasters in the twenty-first century: Modern destruction and future instruction. *Social Forces*. 2008 Dec; 87(2):983–91. Crossref.
2. Cooke MW, Brace SJ. Training for disaster. *Resuscitation*. 2010; 81(7):788–9. Crossref. PMID:20483521
3. Sapir DG, Hoyois P, Below R. Annual disaster statistical review 2013. *The numbers and Trends*; 2013. p. 1–50.
4. Centre for research on the epidemiology of disasters; 2016.
5. Green GB, Modi S, Lunney K, Thomas TL. Generic evaluation methods for disaster drills in developing countries. *Annals of Emergency Medicine*. 2003 May; 41(5):689–99. Crossref. PMID:12712037
6. Bajow NA, Alkhalil SM. Evaluation and analysis of hospital disaster preparedness in Jeddah. *Health*. 2014 Nov; 6(19):1–21. Crossref.
7. Olivia FW, Claudia LK, Yuen LA. Nurses' perception of disaster: Implications for disaster nursing curriculum. *Journal of clinical nursing*. 2009 Nov; 18(22):3165–71. Crossref. PMID:19619209
8. Rubin CB. *Emergency management: The american experience 1900-2010*. CRC Press; 2012. p. 314. Crossref.
9. Bagaria J, Heggie C, Abrahams J, Murray V. Evacuation and sheltering of hospitals in emergencies: A review of international experience. *Prehospital and Disaster Medicine*. 2009 Oct; 24(5):461–7. Crossref. PMID:20066652
10. Yarmohammadian MH, Atighechian G, Shams L, Haghshenas A. Are hospitals ready to response to disasters? Challenges opportunities and strategies of Hospital Emergency Incident Command System (HEICS). *Journal of Research in Medical Sciences*. 2011 Aug; 16(8):1070–7. PMID:22279484 PMCID:PMC3263085
11. Schoenthal L. A case study in the identification of critical factors leading to successful implementation of the hospital incident command system; 2015. p. 1–164.



12. Hospital Incident Command System Guidebook (HICS); 2014. p. 1–170.
13. Jensen J, Thompson S. The incident command system: A literature review. *Disasters*. 2016 Jan; 40(1):158–82. Crossref. PMID:26271932
14. Macintyre AG, Barbera JA, Brewster P. Health care emergency management: Establishing the science of managing mass casualty and mass effect incidents. *Disaster Medicine and Public Health Preparedness*. 2009 Jun; 3(2):52–8. Crossref. PMID:19491589
15. Reilly MJ, Markenson DS. Health care emergency management: Principles and practice. Jones & Bartlett Publishers; 2010. p. 490.
16. Djalali A, Castren M, Hosseinijena V, Khatib M, Ohlen G, Kurland L. Hospital incident command system (HICS) performance in Iran; decision making during disasters. *Scandinavian Journal of Trauma Resuscitation and Emergency Medicine*. 2012 Feb; 20:14. Crossref. PMID:22309772 PMID:PMC3296571
17. Gerrish K, Lacey A. The research process in nursing. John Wiley & Sons; 2010 May. p. 568.
18. Comfort LK. Crisis management in hindsight: Cognition, communication, coordination, and control. *Public Administration Review*. 2007 Dec; 67(s1):189–97. Crossref.
19. Zane RD, Prestipino AL. Implementing the Hospital Emergency Incident Command System: An integrated delivery system's experience. *Prehospital and Disaster Medicine*. 2004 Dec; 19(04):311–7. Crossref. PMID:15645627
20. Donabedian A. Evaluating the quality of medical care. *Milbank Quarterly*. 2005 Dec; 83(4):691–729. Crossref. PMID:16279964 PMID:PMC2690293
21. Röger U, Rütten A, Heiko Z, Hill R. Quality of talent development systems: Results from an international study. *European Journal for Sport and Society*. 2010 Jan; 7(1):7–19. Crossref.
22. Salari H, Esfandiari A, Heidari A, Julae H, Rahimi SH. Survey of natural disasters preparedness in public and private hospitals of Islamic republic of Iran. *International Journal of Health System and Disaster Management*. 2013 Jan; 1(1):26–31. Crossref.
23. Albtoush R, Dobrescu R, Ionescu F. A Hierarchical model for emergency management systems. *University Politehnica of Bucharest Scientific Bulletin, Series C: Electrical Engineering*. 2011; 73(2):53–62.
24. O'Neill PA. The ABC's of disaster response. *Scandinavian Journal of Surgery*. 2005 Dec; 94(4):259–66. Crossref. PMID:16425620
25. Thomas TL, Hsu EB, Kim HK, Colli S, Arana G, Green GB. The incident command system in disasters: Evaluation methods for a hospital-based exercise. *Prehospital and Disaster Medicine*. 2005 Feb; 20(01):14–23. Crossref. PMID:15748010
26. Lazar EJ, Cagliuso NV, Gebbie KM. Are we ready and how do we know? The urgent need for performance metrics in hospital emergency management. *Disaster Medicine and Public Health Preparedness*. 2009 Mar; 3(01):57–60. Crossref. PMID:19002013
27. Shooshtari S, Tofighi S, Abbasi S. Benefits, barriers, and limitations on the use of Hospital Incident Command System. *Journal of Research in Medical Sciences*. 2017; 22(1):36. Crossref. PMID:28465695 PMID:PMC5393096
28. Wagner C, Groene O, Thompson CA, Klazinga NS, Dersarkissian M, Arah OA, Su-ol R. DUQuE Project Consortium. Development and validation of an index to assess hospital quality management systems. *International Journal for Quality in Health Care*. 2014 Apr; 26:16–26. Crossref. PMID:24618212 PMID:PMC4001698
29. Abbasi SH, Tavakoli N. External evaluation of four hospitals according to health care management standards. *Indian Journal of Fundamental and Applied Life Sciences*. 2013; 3(1):24–32.
30. Semnani F, Asadi R. Designing a developed balanced score-card model to assess hospital performance using the EFQM JCI accreditation standards and clinical governance. *Journal of Business and Human Resource Management*. 2016; 2(1):1–16.
31. Shaw CD. External quality mechanisms for health care: Summary of the expert project on visitatie accreditation EFQM and ISO assessment in European Union countries. *International Journal for Quality in Health Care*. 2000 Jun; 12(3):169–75. Crossref. PMID:10894187
32. Wagner C, Gulacsi L, Takacs E, Outinen M. The implementation of quality management systems in hospitals: A comparison between three countries. *BMC health services research*. 2006 Apr; 6(1):1–11. Crossref. PMID:16608510 PMID:PMC1475833