



## INTEGRATING a MODEL of QUALITY MANAGEMENT SYSTEM (QMS) in the HOSPITAL INCIDENT COMMAND SYSTEM (HICS) in IRAN

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### ABSTRACT

**Introduction:** Hospitals should be systematically guided as they provide healthcare services. Their success is linked to the implementation of a successful quality management system. One of the management instruments having an effective role in the services provided by healthcare systems is the Hospital Incident Command System. This study presents an integrated model of a Quality Management System in the HICS in Iran.

**Methodology:** mixed method was implemented in three steps through 2016. First, literature available in valid sites and databases was reviewed. Second, a qualitative study was undertaken based on semi-structured interviews: content analysis was then done on this basis. Participants were identified using a snow ball sampling method. Finally, data were extracted based on the previous stages, and the Delphi Survey Technique was employed in three rounds. The preliminary model was presented in the last round and validated by the Delphi technique. In this step, data were analyzed by descriptive statistics.

**Results:** in the literature review section, ISO, accreditation, clinical governance, and EFQM were recognized as the most commonly used models in healthcare organizations. According to qualitative interviews, five themes and eleven sub-classes were extracted. The proposed model was complemented by the rounds conducted in the Delphi technique. These included three suction, eight main components, and nineteen sub-components. All of these were integrated using similar standards and developing necessary components.

**Conclusion:** given the challenges, the use of quality promotion models for filling gaps in the HICS seems essential for its implementation. According to the findings, the proposed model was developed on the basis of the focus of the Structure, Process, and Outcome, with the aim of improving the performances of health centers, for patients, staff and society.

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### Introduction

Health systems throughout the world prioritize improvement in quality and outcome. The goal of healthcare organizations is to achieve the highest quality of care possible with the resources that are available [1, 2]. From among all innovations and creations influencing healthcare organizations all over the world during recent years, none has been as influential and effective as the development in quality [3]. To achieve an acceptable degree of development and quality, hospitals should systematically identify all aspects of their organization affecting their ability in preventing and reducing incidents and upheavals [4]. So, creating capabilities through proper preparedness for resilience during crises is necessary. Resilience can be cultivated through improvements in information acquisition and dissemination, communication systems, resource management, mobility

management, design for resilience, incident command, and staff versatility. Among multiple components of management, crisis management during unexpected incidents has the most important role in healthcare systems, especially hospitals. As a result, it requires a systematic program for coping with incidents [5]. In fact, its success depends on readiness and awareness of officials with executive methods and the existence of a common terminology. Therefore, applying internationally accepted methods for management of unexpected incidents in organizations seems necessary for managers and other officials [6].

Regarding the significance of the existence of quality in a medical emergency, Albtoush believes that disaster management at all executive levels of an organization results in strategic processes and makes the creation of the necessary intra- and extra-organizational coordination possible via consistent quality and application of new technologies with an appropriate leader [7]. One of the invaluable management instruments having an effective role in empowering services of healthcare centers according to global experiences is the Hospital Incident Command System. The HICS is a management system for controlling, commanding, and coordinating activities of independent groups. It has been designed for achievement of the common goals of inhibition of incidents and reduction of life and financial casualties as well as severe damages and losses. It includes staff members, policies, processes, facilities, equipment, and communications collected in a common, organized structure for incident management and guideline of processes in planning and improvement of responses to emergency operations [8, 9]. Existing literature indicates that paying attention to the significance of designing the HICS for emergencies may cause some aspects of quality to be neglected in it. This system faces challenges in case of occurrence of incidents and vulnerability of its management system before the occurrence of real incidents [10]. Not observing standards of disaster management in designing and the lack of a model for evaluating the system [11], no repeatability of great unexpected disasters, the lack of international standards accepted for making measures, the lack of standards for qualification of officials, insufficient budgets, weakness in the culture of teamwork and accountability, and the lack of methodologies accepted for evaluating the system [12, 13] show that this system has not been able to operationalize all practical measures and plans required for assistance to victims during the reaction stage [14]. Instruments of quality management work by doing a series of activities such as collecting data, describing problems and diagnosing them, doing controls, analyzing data, and controlling incompatible products [15]. Those instruments assist organizations under risk to react better and improve themselves in shorter periods of time by appropriate planning [16].

Similarly, deep changes in knowledge of management have made the existence of an effective evaluation system inevitable: the lack of evaluation in different dimensions of organizations, including evaluation of using resources and facilities, the staff, goals, and strategies, is considered as an organizational deficit [17]. Accordingly, using executive evaluation indices in hospitals can create a new instrument for improving the evaluation quality of incidents and disasters [18]. Hospitals need a performance measurement system for development and completion in order to assess efficacy and effectiveness of plans, processes, and human forces. Different models have been presented regarding performance management of hospital. Those models evaluate organizations from different perspectives and provide appropriate instruments for new performance evaluation [19]. Different studies have been conducted on the need to create a local model for HICS [7, 20]. Results of different studies have confirmed the need to create a new model for HICS. Schoenthal [21] considers the lack of a model for evaluating the system as one of the limitations of applying it. Studies conducted on models of enhancing quality in healthcare systems indicate that the Business Excellence Model, clinical governance, ISO, and the Balanced Scorecard Method are the most widely used standards in hospitals [22]. In studies conducted by Semnani [23], the Balanced Scorecard Method, clinical governance, and Accreditation Standards are employed in hospital evaluation. Given these issues and given that access to organizational goals requires having an appropriate model for performance evaluation, the aim of this study is to integrate a model of quality management system in Iran because organizations cannot execute their plans without considering the results obtained from activities.

## **Methodology**

### **Study design**

The present applied study was conducted in 2016 as a mixed method research in three stages. First, library research was conducted with reference to studies on HICS and models of quality improvement in healthcare systems. In the second stage, interviews were conducted with experts. Participants were selected based on management records, experiences in unexpected incident management and rich information about the subject. Data in this study was collected from individuals and semi-structured interviews based on open-ended questions. After primary coding, secondary and conceptual codes, secondary classes, and main classes were created. Then, themes were extracted and, finally, five main themes were codified. After that, members agreed to observe neutrality regarding codes and extracted classes. The data were analyzed by content analysis. In the last stage, data were extracted and the primary questionnaire was developed based on the Delphi technique.

In the data collection stage, to determine the main constructs of the questionnaire, main concepts and different dimensions of the subject were identified based on the previous stages. In the next stage, to determine the validity of the questionnaire, the primary questionnaire was sent to ten experts and elites in the subject who had conducted research on the subject so that they could comment in writing on the content and structure of the questionnaire. Amendments were made based on their feedback

and 175 questions were configured in according to the Likert five-point scale. In the first round, the questionnaire was sent to participants and those questions with  $\leq 75\%$  were accepted. In the second round, after analyzing the results of the previous round, those questions with  $> 75\%$  were extracted, summarized, and sent to experts in the form of 46 components. As a result, for and against areas were identified. The results in this round resulted in obtaining agreement on data elements based on accumulation of items obtained from the two previous rounds. In the last round, the primary model was developed based on the results of the previous studies, experts' ideas, and validation as per previous rounds. It was then delphied again for validation of the model. In this step, data were analyzed using descriptive statistics.

### Population study

In the first step, data were collected by searching valid websites and databases such as PubMed, Google Scholar, Elsevier, Web of Science, SID, Magiran databases, government reports and documents, and websites of the Ministry of Health .In the second step, target-based sampling began according to the importance of deep examination of the experiences of knowledgeable individuals: 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). Sampling was conducted via the snowball technique and continued until saturation: the sample size so reached was 23, involving participants from different cities in Iran .In the third step, experts were consulted: these were panel members of Delphi elites and lecturers of QMS and HICS in medical universities, Social Security Organization, Red Crescent, emergency centers, and quality certification institutes in Iran. Theoretical sampling was performed in this step. Thirty-one key informants participated in the first and second Delphi round and eight of them in last round. The snowball method was used to continue the work during the sampling using some of the participants' contributions.

### Findings

The results of the first step of the study showed that ISO, accreditation, clinical governance, and EFQM were identified as the mostly applied models in healthcare organizations. Therefore, they were selected as models for the present study. To this end, comparative tables of HICS and selected models of quality improvement in hospital performance quality were presented for deepening learning as well as identifying performances of each model. The center of attention of each model is presented in Table 1.

**Table 1. The structure and content of HICS and select QMS**

Title	HICS	ISO	Accreditation	EFQM	Clinical governance
Origin	NIMS <sup>1</sup>	Military industries	Healthcare	Aircraft Industries	Healthcare
Axis /fundamental elements	-Common Terminology -Modular Organization -Chain of Command -Unity of Command -Span of Control -Management by Objectives -Incident Action Plan -Incident Facilities	-Scope -Normative references -Terms & definitions -Context of organization -Leadership -Planning -Support -Operation -Performance evaluation -Improvement	- Access to care & continuity of care - Patient & family rights - Assessment of patients - Care of patient - Anesthesia & surgical care - Patient & family education - Quality improvement & patient safety -Prevention & control infections - Governance - leadership & direction - Management of communication & information -Medication Management & Use -International Patient Safety Goals - Staff Qualifications	-Leadership - People -Policy & Strategy - Partnerships& resources -processes - People results - Customer results -Society results -Key performance results	#NAME? -Education & Training - Risk management & patient safety - Use of Information - Clinical effectiveness - Clinical Audit - Staff & Staff management
Country of Origin	USA	Geneva/Switzerland	USA	Europe	UK
The way of application	National and international	International standards	National and international	National and international	National and international
Mandatory / voluntary	Mandatory	Voluntary	Voluntary/ mandatory	Voluntary	Voluntary/ mandatory
Issuance of certificates	A vital tool for meeting accreditation requirements	Certification	Certification	Award	Award
Model structure	Modular	QMS	Functional /departmental	Radar management structure	Functional model
Performance evaluation	Risk assessment	Internal and external audit	self assessment External assessment	Process assessment Self-assessment	Clinical Audit
References	(24),(25),(26)	(27),(22),(28),(35)	(29),(22),(19),(28),(17), (30),(35)	(30),(22),(17),(32),(2),(35)	(33),(22),(28),(17), (34),(35)

<sup>1</sup>National Incident Management System

Qualitative interviews with the experts were undertaken in the second stage as per the results obtained from the previous stages. Those interviews were conducted in two main sections, including specialized questions regarding HICS and QMS. With regard to the obtained results, the average age of participants was 45.13 years old; about 61% of them held Ph.D. In terms of their executive records, about 30.5% of the participants enjoyed management records in the two components of management quality and HICS. In the present study, researchers applied the content analysis technique, qualitative data analysis, and data classification to identify components used in HICS and QMS. Then, main themes and models were extracted from data. In this method, coding and classification are directly adopted from raw data via the inductive method. The number of main classes was 11: finally, 5 themes were extracted. Table 2 illustrates main themes and classes.

**Table 2. Main themes and sub themes**

Themes	Sub themes
Achievements resulting from the implementation of HICS	Achievements resulting from the implementation of HICS
	Meeting the requirements of HICS
	Design and development of HICS based on the standard structure
Dimensions influenced by HICS	Crisis management cycle in HICS
	Characteristics of HICS
Strategies and priorities	Vulnerability assessment based on hospitals safety index
	Hierarchical structure
	Importance and necessity of HICS
The models of quality improvement in health centers	Qualitative elements of QMS resulting from establishment of QMS
Suitable model of HICS	Structure, process, outcome
	Communication and quality management models

The third step was the development of a questionnaire based on the Delphi technique. In this step, researchers codified a large number of statements, each considering an aspect of the construct or sub-construct under study [24]. The criterion for rejecting or selecting an item was based on experts' consensus. After analyzing the participants' answers, the researchers combined them with each other and created a complete list. According to the results obtained from the first round, the Delphi questionnaire was developed in the second round. This section completed into two subsections. The first subsection consisted of components indicating the participants' ideas regarding adding/editing the components, and the second subsection included components which did not reach 75% consensus. In the second round, 32 components were extracted out of the questions as per the results. However, 14 components having consensus lower than 50% in the second round of the Delphi technique were deleted. At last Delphi technique was implemented and, overall, 185 components were agreed on by key domestic informants with consensus rate of over 75%. Analysis of the participants' viewpoints in the third round demonstrated that the scope of the model was considered in sub themes of structure, process, and outcomes. Thereafter, some of the components in the main and secondary sections were derived to be among the most important components of the model: this was confirmed by the researchers, and the preliminary model was presented. Main sections were assigned to eight categories: Management & leadership & direction, modular organization in structure, operation, support and planning in process and performance result, improvement, assessment and performance analysis in outcome. Main components of the model were codified based on the PDCA. Qualitative elements of the model were classified into subgroups of the main and secondary sections. The qualitative elements of HICS were determined based on the identification of contributing factors and the distinction between selected models. HICS based on the components, processes, structure, and outcomes of the hospital is presented in Table 3.

**Table 3. Quality elements in HICS**

Structure			
Management & leadership direction		Modular organization	
Customer focus	Resource management	Organization Management System	Organization structure
Patient's Family Rights	Span of Control Management	Objectives, Strategies & Tactics	Hierarchical
Patients and Personal Satisfaction	Infrastructure/facilities Management	Management by Objectives	Hospital Incident Management Team
	Authority and Responsibility		Chain of Command

Process										
Operations				Support				Planning		
Services		Control of nonconforming		Organizational knowledge		Information & Communication Management		Environment	Processes management	Identify opportunities for improvement
Health care services		Prevention		Training		Internal & External communication		Safety Environment	Process & policy related to incident	Incident Recognition
Outsourcing				Exercise, scenario		Documentation			Incident planning guides & Incident Response Guides	Mitigation
Evacuation				Common terminology		Transportation			Risk Management	
Tracking										
Outcome										
Results				Improvement			Assessment & performance analysis			
Society	Organization	Staff	Patients	Continual improvement	Non-conformity & corrective action		Internal audit/ external evaluation		Control	
				Demobilization	Corrective action and improvement plan		HICS Evaluation		monitoring & analysis	

**Discussion**

The present study was conducted with the aim of developing a model of QMS in HICS in Iran. Some of the investigated studies indicated that validation, ISO, Excellence Model, and clinical governance are the most applied models in the healthcare systems in Iran and the world. Moreover, they have standards related to the healthcare system with similarity in quality elements [17, 19, 23, 25-29]. The healthcare field requires methods accepted by the world in cases of disasters and incidents. Thus, the use of accurate models for evaluation of HICS seems necessary [11]. According to findings obtained from the literature, this system has not been able to operationalize all practical measures and plans required for assistance to victims in the reaction stage [14]. Schoenthal considers the lack of a model for evaluating the system as one of the limitations of applying the system [21]. Studies also show that the establishment of quality models in healthcare centers has positive effects on the achievement of hospital goals, enhancement of quality of services, increase in job satisfaction, increase in organizational learning, improvement in performances, and evaluation of centers [27, 30, 31]. Other studies regarding the establishment of modern standards of evaluation have the following three categories of process, outcomes, and structure [32, 33], which are consistent with the present study. The first scope presented in this model is structure. Studies conducted in this category indicate that management organization and attention to priorities of structural and non-structural elements in hospitals are necessary for the operation in the HICS [34, 35]. Regarding studies related to QMS in this group of studies, the establishment of standard management methods leads to continuous control of standards related to infrastructure and workplaces [36]. The second main category in the scope of the standard model is the structure related to leadership. According to studies conducted on HICS, lack of motivation and commitment in managers [37] as well as the need for leadership monitoring in HICS as an evaluation method [12] are challenges of the system. Studies conducted regarding the category of QMS show that resource management is one of the factors affecting healthcare services. It can result in patients' satisfaction [38], cause promotion of resource management and customer focus after the establishment of QMS [39]. The second scope presented in this model is the process which divided into the three main sections of operations, support, and planning. Studies conducted on planning in HICS show that the lack of appropriate planning about hospital readiness against natural disasters such as readiness in cases of transfer of patients, medical evacuation, and security [37, 40] are some other challenges of HICS. Studies related to select models of quality management also indicate that one of the factors affecting quality of healthcare services is planning and management of processes [38]. Studies conducted on support show that the following are major issues: the lack of a complete system for submitting information [20], the need to communicate a plan affecting the increase of information management both inside and outside organizations [21], and the necessity of interactions with other organizations and coordination among other departments of HICS [41]. Studies related to select models of quality regarding above issues indicate that the focus of hospitals in operationalizing QMSs is on intra- and extra-organizational training and communications [30, 42]. The studies conducted on the main section of operation demonstrate a need to develop operational plans [40] and identify risks: these, in turn, show the necessity of paying attention to controlling incompatible products in HICS [7]. Studies related to QMS show that attention to operational criteria is one of the levels presented in the hospital evaluation model [23]. The first, main section of the scope of standards of outcomes is related to performance evaluation. Studies conducted on

“performance evaluation” show that in spite of doing Assessment of Hospital Preparedness for incidents [37, 40], there is no accepted methodology for performance evaluation: this causes weakness in performance evaluation of outcomes of services [12, 10, 21]. Investigations of sections of the model based on select models of quality illustrate that applying a set of appropriate methods such as monitoring, planning, auditing, and evaluating the system for achievement of favorable outcomes [23] have positive effects on the establishment of QMS. However, the results of this study show that the component of clinical audit has no significant correlation with organizational performance [43]. This issue is not consistent with the results of the present study. Studies conducted about “improvement” as a main component of the model show that there is no certain reason for corrective action in the last version of HICS [21]. Studies conducted on adopting QMS also show the positive effect of the system on improvement of managers’ and staff’s performances as well as consistent improvement of quality [19, 44]. The last section of the model in outcomes is related to the results. In studies conducted on the results of HICS, the relationship with social shareholders [21], coordination with external institutions related to incidents in society [25], and sharing resources among all healthcare organizations and institutes [45] were considered. All these issues show the significance of paying attention to performance outcomes of HICS at different levels in or outside hospitals. Studies conducted on QMS in this category indicate that the staff’s awareness of patients’ rights, increase of interactions among the staff [38], attention to the staff as the most important element of organizations [43], and the increase in organizational performances and improvement in customer satisfaction [28] are results of establishment of models of quality improvement in hospitals.

### Conclusion

HICS is an efficient system for preparing and increasing efficiency of hospitals facing incidents. One of the most important goals of applying HICS is to react timely to incidents, achieve operational aims, manage incidents, and ensure effective and optimal use of resources. According to studies and the findings obtained from them, there are barriers causing inefficiency of this system in Iran. These are the focus of hospitals to guidelines and documents of organizing unexpected incidents, failure to identify components and characteristics of the system and executive stages, lack of sufficient training and participation of the staff, no localization of HICS, lack of powerful organizational commitment, and lack of a single model of QMS in HICS with complete overlap. As the result of these limitations, incidents and disasters are not managed appropriately and may result in imposing a lot of damages to the healthcare system. Therefore, the necessity of appropriate planning, prioritization of policies and activities, intra- and extra-organizational coordination in case of incidents, reinforcement of forces by properly organizing them, presentation of required training and long-term strategies, and the design of HICS by considering the Iranian context are available strategies. Considering the existing challenges for implementation of this system, quality instruments should be used for compensating gaps in HICS. Quality improvement systems can present an appropriate structure for monitoring and evaluating performances, implementing quality improvement plans, exerting efforts for improving efficacy and efficiency of services, achieving executable standards in healthcare centers by focusing on standards of process, structure, and outcomes. They should also emphasize their components such as organizational management system, management and leadership, human resource management, customer focus, planning and management of processes, support, organizational knowledge and personal and team development plans, special process outsourcing in operations, performance evaluation, internal and external audits, improvement, and outcomes of performance for the society, organization, individuals, and patients. Moreover, they should provide the possibility of filling gaps in HICS. As a result, the present study tries to identify limitations and challenges existing in HICS by reviewing literature and presenting a model based on QMS.

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