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Training Courses and Staff Knowledge for Implementation of High Reliability Organizations Model in Farabi Eye Hospital, Tehran, Iran

Seyed Mohammad Hadi Mousavi,[1] Mahmoud Jabbarvand,[2] Hojjat Zeraati,[3] Hossein Dargahi,[4,*] Akram Assadollahi,[5] and Seyed Ahmad Mousavi[6]

[1]PhD by Research Candidate, Health Information Management Research Center, Tehran University of Medical Sciences, Tehran, Iran
[2]Professor, School of Medicine, Farabi Eye Hospital, Tehran University of Medical Sciences, Tehran, Iran
[3]Professor, School of Public Health, Health Information Management Research Center, Tehran University of Medical Sciences, Tehran, Iran
[4]Professor, Health Care Management Department, Health Information Management Research Center, Tehran University of Medical Sciences, Tehran, Iran
[5]BSc. In Health Care Management, School of Allied Medicine, Tehran University of Medical Sciences, Tehran, Iran
[6]MSc in MBA, Tehran University of Medical Sciences, Tehran, Iran

[*]*Corresponding author*: Hossein Dargahi, Professor, Health Care Management Department, Health Information Management Research Center, Tehran University of Medical Sciences, Tehran, Iran. Tel: 98-2188982997; +98-9123010027, Fax: +98-2188982997, E-mail: hdargahi@sina.tums.ac.ir

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Abstract

Background: Hospitals as the most common health care centers should be changed into high reliability organizations to achieve the best performance and also improve patient safety. High reliability organizations can manage adverse events better, and create a safe environment for patients and staff. This requires accurate planning, training, and high responsibility and commitment hospitals leaders to implement this model.
Objectives: The current study aimed to determine the knowledge of Farabi eye hospital's managers and supervisors of the departments, and the success of this hospital to implement high reliability model before and after the training course.
Methods: Study was a semi-experimental research. Data were collected through a questionnaire and a checklist in two phases, before and after the training course of high reliability model; 80 clinical and non-clinical managers and supervisors of Farabi eye Hospital in Tehran, Iran, participated in the study by census method.
Results: After holding high reliability model training course, 52.2% of respondents expressed obtaining a keen knowledge of high reliability organizations model. Compared to knowledge of the managers and supervisors of the departments before the training course (18.8%), it was indicated that high reliability organizations model training course had a significant effect ($P < 0.001$) on the knowledge development. Also, the results of this research showed that implementation of high reliability organizations model after the training course increased ($P < 0.001$).
Conclusions: Although, successful implementation of high reliability organizations is based on knowledge of managers and supervisors, the effectiveness of this model is still in the maturity and readiness phase.

Keywords: High Reliability Organizations, Patient Safety, Farabi Eye Hospital

1. Background

Human life is measured by hospital scale. All people refer to hospitals from birth to death. However, medical errors, nosocomial infections and non-conventional methods of payment may change the view of clients toward hospital performance (1).

Human error is defined as a situation in which the planned sequence of physical or mental activities to achieve the desired result fails or the existence of an inappropriate program or unplanned action (2). In an effort to protect patients, patient safety regulation and the medical report of errors that harm patients and staff are presented by joint committee on accreditation of health care organizations (JCAHO) (3). However, a great number of medical errors occur in hospitals every year. The report of American medical institution, entitled "to err is human" reported that every year 44,000 to 98,000 of Americans encounter side effects of medical errors as one of the important causes of mortality in the United States (4, 5). In addition, about 70% of the reported medical errors are predictable, and at least 50% of them are not reported (6). In most cases, medical errors are not due to the mistakes of physicians and nurses; they originate from many different sources such as inefficient health systems, inadequate training and lack of safety regulation (7, 8).

Achieving high reliability as a main goal of hospitals needs maximum efforts of managers, and implementing effective and efficient management to achieve these goals (9, 10). Therefore, implementation of health care system with safe structure requires the application of a new paradigm named high reliability organizations (HROs),

which means to reduce errors and increase patient safety in hospitals (11). HRO refers to an organization with complex and risky features, yet safe and effective (12). The main elements of this organization are commitment to use safety elements, create safety and learning culture (13).

A team of researchers of Berkeley University of California State in America created high reliability organizations for the first time known in risky industries, aircraft carrier, air traffic control, fire departments, disaster management and military and nuclear organizations. These organizations have common characteristics; having social environment, high risk technology, the possible consequences of errors leading to organizational learning through trial and error, and possessing technology and process complex management to prevent the errors (14-17). Moreover extensive criticism acceptance, periodical inspection to prevent errors, managers' knowledge and positive thinking toward the cause of errors and their high responsibility and accountability are distinguishing characteristics of such organizations (18).

Recent studies imply that high reliability organizations emphasize the improvement of reliability, prevent and compensate errors immediately, and enforce effective management through monitoring and controlling risky technology (19). Weick and Sutcliff introduced five distinguished features of high reliability organizations including:

• Preoccupation with failure

Focus on predicting events and concerning about failure, persistent mindfulness and rapid discovery and response to all errors and failures are considered as a possible warning of larger failures. Constant research is for near miss opportunities, which can help the organizational performance improvement (20).

• Reluctance to simplify interpretations

Mistakes and errors can be prevented by not interpreting problems simply, but by opposing errors' excessive simplification, knowing the importance of collecting, analyzing and prioritizing all the warning signs. To deal with this thinking method, various teams are formed in high reliability organizations to use the experience of team members who understand the complexity and specific nature of their profession and participate in decision-making effectively (10).

1.1. Sensitivity to Operation

Sensitivity to organizational operation is effective in initial diagnosis and dealing with problems by continuous changes of guidelines and policies. Sensitivity to operational elements reduces the number of errors quickly detected before their consequences appear (20).

1.2. Commitment to Resilience

Commitment to resilience represents the positive ability of high reliability organizations in establishment of the accountability and encountering culture and flexibility and returning to normal condition after the unexpected events. Commitment to resilience can be improved in health care systems through support of patient safety by effective human resources management and developing learning culture (10).

1.3. Deference to Expertise

Deference to expertise does not mean eliminating organizational hierarchy, but it is the organizational ability to delegate the authority and job independence to specialized staff to solve the problem. High reliability organizations develop free relationships in all the organizational levels to identify and value specialization (21, 22).

High reliability organizations are considered special organizations due to improvement of the quality, promotion of staff to learn by continual education, effective reward system, effective and continuous auditing of processes and mechanisms (23, 24). Showing organizational citizenship behavior (OCB), commitment to responsibility and accountability towards reliability, managers' concern about the misinterpretation, ignorance, misunderstanding, wrong conception of staff about organizational performance and increased inspection as an instruction to deal with the potential dangers are the other obvious properties of such organizations (25).

On the other hand, health care organizations should seek to establish high reliability organizations model by improving the focus of these organizations on details, error detection and correction, and emphasize the creation of safety culture (26, 27).

2. Objectives

Therefore, study aimed to determine the knowledge of medical and non-medical managers and supervisors about high reliability organizations (HROs) model and the deployment extent of this model before and after the training course in Farabi eye hospital of Tehran University of Medical Sciences, Tehran, Iran in 2016. In other words, authors sought to answer the question whether the training course provided a way to establish and develop high reliability organization model in this hospital or not.

3. Methods

The current semi-experimental study was induced in 2016 at Farabi eye hospital in Tehran, Iran. It is a specialized,

state governed referral hospital with 450 beds and medical and non-medical departments. Medical departments of this hospital include eight inpatient departments, emergency, intensive care, angiography, radiology, optometry, stem cell providing center, medical records, laboratory, outpatient and clinics; and non-medical departments include engineering, central store, occupational health, nutrition and dietitian, laundry, computer center, central sterilization, statistics, bureau of patient safety, clinical governance office, public relations, medical working , library, audio-visual center, secretariat of seminars and medical instrument. Data were collected through researcher-made questionnaire and checklist. Staff knowledge questionnaire about HROs model has 24 questions.

Demographic data of the respondents such as age, years of experience and educational level were collected along with this questionnaire. Content validity was used to determine the validity of HROs questionnaire. For this purpose, two English translators first rendered the reference texts into Persian. Then, two other translators checked the translations in terms of adequacy, clarity, quality, terminology and contextual equivalents. In the next stage, the translations were back translated by another translator, and then the results were compared. Later, this questionnaire was given to five experts of hospital management and hospital accreditation. In the last stage, content validity index (CVI) was 0.85, which indicated the validity of this questionnaire.

To calculate the reliability by test-retest technique, HROs questionnaires were completed by the staff not included in the research sample for the first time and completed again by them with a two-week interval to prevent chances of remembering. Therefore, the internal correlation coefficient (ICC) was 0.89. Cronbach's alpha was employed to calculate the internal cohesion of HROs questionnaire as 0.72.

Questionnaires were distributed among 80 hospital managers, supervisors and key staff of the departments selected by census method, and after HROs training course the same people completed the questionnaires. To implement the training course, first the training protocol was prepared by patient safety improvement approach and by individual and organizational goal improvement. This training course package included patient safety and high reliability organizations model. The target group was the managers and supervisors, and key staff of medical and non-medical departments of Farabi eye Hospital. The training course was taught to the target group through several separate workshops lectures, small group discussions along with educational pamphlets.

Sample size was determined by census method. Moreover, inclusion criteria were minimally one year of work experience and tendency toward cooperation; the exclusion criterion was lack of tendency toward cooperate. Finally, all of the 80 managers, supervisors and key staff from 33 medical and non-medical departments participated in the research.

The checklist to assess HROs model establishment was prepared based on related references including five elements: patient safety, reluctance to simplify interpretation by managers and staff, sensitivity to operation, commitment to resilience of the managers and staff, and deference to expertise. Five hospital accreditation experts and specialists confirmed the checklist validity. Data were collected using the checklist by interviewing 80 managers, supervisor and key staff working in 33 medical and non-medical departments and observing HROs compliance or non-compliance elements by them. The level of respondents, HROs knowledge was measured three scales: not at all, $< 50\%$, somewhat (50% - 75%), and very much $> 75\%$. Data were analyzed by SPSS software version 16.

Descriptive results were presented.

Nonparametric Wilcoxon test was employed to compare HROs knowledge of participants and establishment of HROs model before and after training course at 0.05 level of significance. All variables were tested by nonparametric tests.

Correlated test, paired samples T-test, McNemar and generalized estimating equation (GEE) regression were used to assess participants' knowledge about HROs model and observation of HROs model elements.

For research ethical considerations, the necessary permissions were acquired from the director of Farabi eye hospital. Also, the research goals were completely explained to the respondents. Moreover, the respondents were assured of the confidentiality of their personal information. Finally, Tehran University of Medical Sciences research committee approved the study.

4. Results

After the training course, 47.5% of the respondents were somehow familiar with high reliability organizations model (HROs), and 52.5% admitted that they were completely familiar with this model, although, only 18.8% proved completely familiar with HROs model before the training course. In other words, the staff knowledge increased significantly after HROs training course ($P < 0.0001$) (Table 1).

The results of Table 2 showed that total knowledge of staff about HROs model increased after training course. It was obvious for HROs elements. Also, establishment of compliance with various elements of HROs after training courses increased significantly ($P < 0.0001$).

Table 1. The Comparison of the Respondents Knowledge Regarding HROs Before and After the Training Course in Farabi Eye Hospital[a]

Total Knowledge	Somewhat	Very Much	Total
Before the course	65 (81.2)	5 (18.8)	80 (100)
After the course	38 (47.5)	42 (52.5)	80 (100)

[a]HROs, high reliability organizations.

Table 2 . The Absolute and Relative Differences of Establishment Condition of HROs Model Components Before and After the Training Course in Farabi Eye Hospital

HROs[a] Elements	Condition	Somewhat	Very Much	Z[b]	P Value
paying attention to patients' safety in the hospital	Before	49 (60.1)	31 (38.8)	3.363	0.001
	After	28 (35)	52 (65)		
Preoccupation with failure	Before	58 (72.5)	22 (27.5)	2.683	0.007
	After	46 (57.5)	34 (42.5)		
Reluctance to simplify interpretations	Before	61 (76.3)	19 (23.8)	5.516	< 0.001
	After	27 (38.7)	53 (66.3)		
Sensitivity to performance	Before	50 (62.5)	30 (37.5)	3.889	< 0.001
	After	28 (35)	52 (65)		
Commitment to resilience	Before	50 (62.5)	52 (37.5)	4.55	< 0.001
	After	33 (38.8)	49 (61.3)		
Deference to expertise	Before	53 (60.3)	27 (33.8)	4.964	< 0.001
	After	22 (27.5)	58 (72.5)		
Total knowledge	Before	65 (81.2)	15 (18.8)	4.700	< 0.001
	After	22.38 (47.5)	42 (52.2)		

[a]HROs, high reliability organizations.
[b]Wilcoxon test.

Table 3. The Correlation Between Staff's Demographic Variables and the Impact of Training Course on Improving the Condition of HROs Deployment Elements

HROs[a] Elements Demographic Factors	Ag (P Value)	Years of Working Experience((P Value)	Educational Level (P Value)
Patient's safety	-0.34 (0.766)	-0.74 (0.514)	0.043 (0.704)
Preoccupation with failure	-0.27 (0.814)	-0.14 (0.899)	-0.84 (0.458)
Reluctance to simplify interpretations	0.78 (0.489)	0.120 (0.287)	-0.061 (0.591)
Sensitivity to operation	0.87 (0.445)	0.110 (0.332)	0.078 (0.490)
Commitment to resilience	0.13 (0.911)	0.77 (0.496)	0.001 (0.990)
Deference to expertise	0.96 (0.392)	0.24 (0.832)	0.167 (0.140)

[a]HROs, high reliability organizations.

According to Table 3, none of the demographic variables such as years of work experience, age and educational level of staff influenced the HROs training course.

5. Discussion

The current study assessed the preparedness of Farabi eye Hospital about implementation of HROs model along with the knowledge of mangers, supervisors and key staff of each medical and non-medical department about HROs model and its elements. Moreover, the current study was the first research to introduce and assess HROs paradigm in Iranian health care organizations and health care system. The results showed that Farabi eye Hospital as a referral center of visual disease can play an important role to implement HROs model.

Hospital is one of the most important health care organizations that most of the resources should be allocated to it, and special attention should be paid to the quality of services provided by this organization. One of the most effective methods of ensuring safety and quality improvement can be provided by deployment of the high reliability organizations model in hospitals. Possession of desired performance is one of the factors that can promote hospitals into high reliability organizations (28).

To implement the HROs model in Farabi eye Hospital, knowledge of staff, managers and supervisors of the departments about high reliability organizations model was measured. Then, HROs training course was prepared and organized in this hospital. New aspects of the training course were focused on identifying errors and the way they occur, establishment of a team attitude in decision-making, being aware of how decisions influence the organizational performance, creative employment of problem solving strategies and finally find the source of the error instead of only blaming and punishing staff for their mistakes (29) were the other aspect of HROs training courses.

Although the Landmark medical institution report on human errors in hospitals was published more than a decade ago, health care specialists still try to prevent the risks related to patient safety (11). Health care policy makers in the public and private sectors try to remove the problems related to patient safety, and improve the quality of service and operations in hospitals (30). Although, many health care organizations deploy high reliability organizations model, there are many shortcomings in quality and patient safety in such organizations due to more complex care (31). Senior managers of hospitals should continuously emphasize the importance of patient safety and the mutual creation of learning culture in which the events and errors are identified and analyzed truly and their results are used to improve outcomes in the organizations. Hence, it is necessary to consider decency along with courtesy and kindness as the main foundation of patient safety culture in the hospitals (32). Moreover, the safety culture and implementation of a comprehensive safety program are not achieved by the appearance of threatening behaviors. Inappropriate behaviors may cause many problems to provide desired services to patients. Finally, creating a responsible and accountable system is a good way to reach high reliability organizations (33).

Managers, supervisors and key staff of Farabi eye Hospital stated that they were more reluctant to simplify interpretations of problems after the training course. Simplifying the problem interpretations would result in the loss of information and limit the ways to achieve organizational goals. High reliability hospitals do not accept simple solutions when confronted with complicated challenges, and their staff is expected not to view failures and errors as a result of just a simple case (34).

Sensitivity to hospital performance was another characteristic of HROs model that managers, supervisors, and key staff declared that their knowledge about this element of HROs model increased after the training course. Previous studies declare that managers can show their sensitivity to hospital performance by encouraging positive behaviors regarding safety regulations and accomplish safety precautions (35).

Managers commitment to resilience and flexibility when faced with human errors and unexpected accidents is another element of HROs model for which Farabi eye Hospital managers of departments showed a higher amount of knowledge after the training course. This process is related to effective prediction of errors, learning ability to tolerate unexpected accidents, and fast assessment of situation after the failure (36).

Most of the study participants expressed that their knowledge about deference to expertise as a HROs model element was higher after the training course. In high reliability hospitals, staff is trained to recognize and respect the expertise. Moreover, in such hospitals, a culture is developed in which everyone at whatever level shares his knowledge with others (37, 38).

The participants believed that their knowledge about preoccupation with failure as a HROs model element was higher after the training course. By developing a learning culture, the staff is encouraged not to hide their mistakes, but report their human errors and not to be frustrated (39, 40).

Using systematic ways to analyze failure factors and resolve complex problems is one of the other most important causes of creating high reliability organizations that is necessary to be considered by hospital managers (26). To establish HROs paradigm, hospitals should try to achieve greatness and significance. To do so, self-assessment of the present situation of organization according to leadership and safety culture is the first step. By self-assessment, hospital staff becomes fully aware of organizational attempts to improve and progress (20).

A limitation of the present study was using self-assessment HROs questionnaire to managers, supervisors, and key staff of medical and non-medical departments of Farabi eye Hospital. Second, it was a cross- sectional study in 2016; therefore, the staff knowledge about HROs may be different in next similar studies.

5.1. Conclusion

The findings of the current study showed that the training course successfully increased the staff knowledge and HROs establishment.

High reliability organizations model is an effective tool by which senior managers and policy makers of health care systems make organizational operations more reliable. In other words, high reliability organizations ensure validation by safety improvement as the first goal, change organizational culture toward reliable operations, investing on staff continuous training, and developing staff positive thinking. High reliability organizations provide a vision and attitude toward the resistance against occupational

hazards. Finally, the effectiveness of high reliability organizations is still in the state of maturity and readiness, but evidence suggests that attention is paid to the high reliability organizations paradigm. Hospitals should achieve high reliability organizations standards and attain the best practice to establish a safe work environment with high quality services as suggested below:

1. Establishment of high reliability organizations concepts and culture;

2. Attainment of hospital managers' commitment, dedication and support to implement the high reliability organizations model;

3. Creating an organizational climate of trust between managers, staff and patients;

4. Forming teams to identify medical errors and offer solutions;

5. Focus on anticipating rather than reacting to the events.

5.2. Ethical Consideration

Ethical issues such as plagiarism, informed consent, abuse, forgery or falsification of information and dissemination were fully respected by the authors.

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