Improving Patients' Care through Electronic Medical Error Reporting System

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Abstract

Background and Objectives: Medical errors are unintentional acts that take place due to the negligence or lead to undesirable consequences in medical practice. The purpose of this study was to design a conceptual model for medical error reporting system.

Methods: This applied descriptive cross-sectional research employed Delphi method carried out from 2012 to 2013. The study population was medical and paramedical personnel of health workers and paramedical personnel of hospitals, deputy of treatment, faculty members of Kashan University of Medical Sciences in addition to the internet and library resources. Sample size included 30 expert individuals in the field of medical errors. The one-stage stratified sampling procedure was used. The items with opposition ranging 0 to 25 were confirmed and those exceeding 50 were rejected whereas the items with the opposition 25 to 50 were reevaluated in the second session. This process continued for three times and the items that failed to be approved were eliminated in the model.

Results: Based on the results of this research, repeated informing about and reporting operation at on-line bases that have access to the incidence of error detected on time, identifying cause and damage due to the incidence reported confidential and anonymously immediately after the occurrence is necessary. Analysis of data quantitatively and qualitatively by using computer software is needed. Classifying the errors reports based on feedback provision according to the cause of error is needed. In addition, confidential report and possible manual retrieval were suggested

Conclusion: It is essential to determine the means of reporting and items in the reporting form including time, cause and damage of medical error, media of reporting and method of recording and analysis.

Keywords: design, informing, medical error, reporting,system.

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Introduction

Medical errors are unintentional acts that occur due to the negligence or carelessness which fail to lead to a desirable consequence in medical practice. A medical error is defined as the action made or decision taken in a health-care setting that does not conform to the health standards set in the field.

Health standards are a set of procedures and acts to ensure the regaining of patient's health. They are logical acts and well-defined goals that are mandatory to be followed by the practitioners based on the condition and the accessible facilities (1). The occurrence of medical errors in extensive professions such as medical settings is not unusual and the medical professionals are always seeking means by which to avoid

or reduce them. Since many cases of medical errors are not reported, estimating an approximate rate is very difficult (2). According to the results of a research, 195000 deaths take place every year due to medical errors (3).

The main cause of many medical errors is the insufficient access to information at the time of decision making and poor communication among the caring team that usually work in manually operating systems. Sedghiani has indicated that one of the items in regard to the evaluation of hospital is the inclusion of error report form, its analysis and the result of such report on the delivery of services (4). There are many ways for reducing medical errors and increasing the safety of patients (5). One of them is discovering the errors through employing a reporting system (6). A health care system will benefit from discovering a medical error only when there is a comprehensive program and proper mechanism for analyzing the condition under which the error took place and then implement appropriate measure to prevent its recurrence (7). Such a management system requires understanding of the causes of errors and introducing plans to prevent them before they lead to harmful occurrences; a system that will propose strategies and guidelines to avoid the likely errors and dangers that may occur in future.

Error reporting systems employ efficient methods for eliminating errors in a health care system. Error reporting may be committed voluntarily or involuntarily. The voluntary method of error reporting is done by physicians and personnel within the medical centers who are directly in contact with patients either para-clinically or clinically. The involuntary reporting is carried out according to the assignment and duties defined by the health care and medical service system (8). The result of researches have indicated that systems that employ voluntary and involuntary error reporting method are more efficient and more errors are reported by physicians so that that the rate of reporting increases 20 times (10). The importance of error reporting system is such that many medical centers conduct error reporting through their computer systems (11, 12).

A successful error reporting system must be confidential and non-punitive. The analysis of errors and reporting their explanation must be performed by expert personnel who understand the clinical cares and causes of error systems. The report must be available on time. It must rely on and emphasize the processes instead of individuals; it must be capable of responding appropriately to the needs of the system; employ proper media and be accessible to the public. In designing the medical error reporting system, it is important to focus on systems, processes and services instead of individuals. The system must be able to provide the appropriate responses to the beneficiary organization; it must be easy to learn and use and release its result in a suitable medium and be accessible to the public.

The design of medical error reporting system must focus on important issues such as the reporting of events, ease of using computer technology and even web, evaluation of effectiveness, and capability of executive system review of goals, and obstacles in the use of reporting system, procedures for classification and reporting errors (8, 13. 14). The purpose of this research was to design a conceptual model for medical error reporting system that has the capability of reducing the medical errors and facilitating management affairs.

Methods:

This applied descriptive cross-sectional research employed Delphi technique between 2012 to 2013. The study population was medical and paramedical personnel. Sample size included 30 expert individuals in the field of medical errors. The means of determining sample size was the one-stage stratified sampling procedure. The experts were selected from 5 categories including 3 physicians (faculty members), 17 nurses, 2 midwifes, 7 paramedics and one manager. The selection was based on the proportion of every profession.

The inclusion-exclusion criteria were based on the involvement of the experts in the occurrence of medical errors, who were working in the offices of clinical governance or members of the committees' accreditation assessment of the hospitals. The questionnaire was based on the

library resources aligned with the research objectives. The validity of the questionnaire was confirmed through face and content validity and question items were corrected based upon opinions of 3 experts. To calculate the reliability of the questionnaire, split-half method was used and alpha level equal to 0.76 was calculated. The first draft of the questionnaire was presented to the experts. The item with opposition ranging 0 to 25 was confirmed and those exceeding 50 were rejected whereas the items with the opposition between 25 to 50 were put forward to the next step and reevaluated in the second session. This process continued for three times and the items that failed to be approved were eliminated in the model.

Results

The result of analysis of data indicated that informing the personnel about the reporting medical error is a necessity. The main components of the system are: a) recording the event, b) analyzing and c) feedback and reporting the result (figure 1).

In regard to the informing of reporting medical error, the results showed that the highest frequency of agreement among the expert in the first stage of reporting was the written
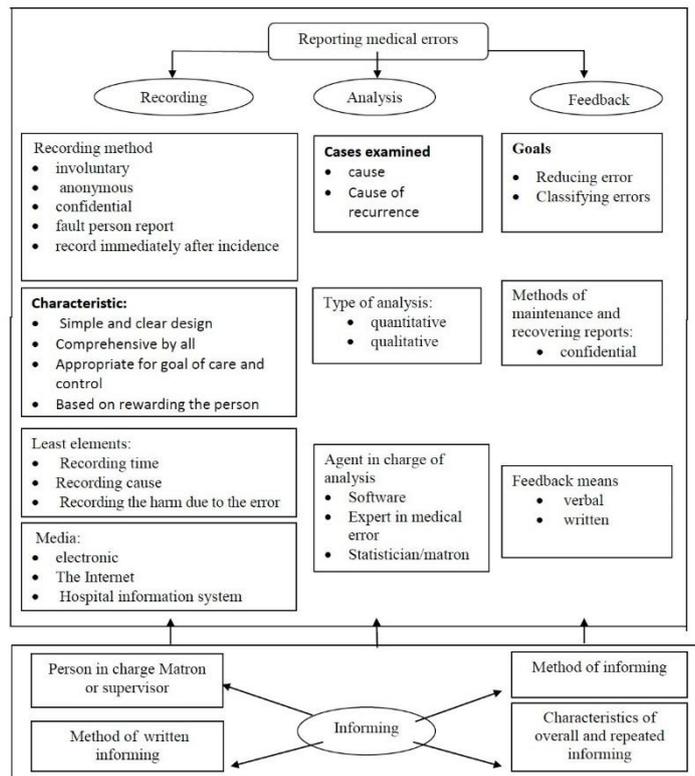

Figure 1: Conceptual schema of medical error reporting system

informing form 29 (96.7%). In addition, written informing method by matrons and educational supervisor was deemed necessary while the use of poster and brusher was suggested (table 1). Data analysis also showed that implementing an involuntary rule for recording the medical error

Table 1. Frequency Distribution of Expert Opinion regarding the Informing System

Opinion Item		agree Frequency (percent)	disagree frequency (percent)	No opinion frequency (percent)	First stage result	Second stage result	Third stage result
method	verbal	10 (33.3)	9 (30)	11 (36.7)	reassessment	remove	*
	written	24 (80)	1 (3.3)	5 (16.7)	confirm	*	*
Person in charge	matron	15 (50)	5 (16.7)	10 (33.3)	reassessment	confirm	*
	Educational supervisor	18 (60)	2 (6.7)	10 (33.3)	confirm	*	*
media	Internet	9 (30)	12 (40)	9 (30)	reassessment	remove	*
	journal	10 (33.3)	10 (33.3)	10 (33.3)	reassessment	reassessment	remove
	booklet	12 (40)	8 (26.7)	10 (33.3)	reassessment	reassessment	remove
	brochure	15 (50)	7 (23.3)	8 (26.7)	confirm	*	*
	poster	14 (46.7)	11 (36.7)	5 (16.7)	reassessment	confirm	*
	television	8 (26.7)	13 (43.3)	9 (30)	remove	*	*
	satellite	2 (6.7)	16 (50.3)	12 (40)	remove	*	*
characteristics	Repeated informing	22 (73.3)	6 (20)	2 (6.7)	confirm	*	*
	Overall reporting in hospital	29 (96.7)	1 (3.3)	0 (0)	confirm	*	*

* did not enter at this stage

Table 2. Frequency Distribution of Expert Opinions about the Recording of the Events

	Opinion Item	Agree frequency (percent)	Disagree Frequency (percent)	No opinion frequency (percent)	First stage result	Second stage result	Third stage result
Recording Method	Arbitrary recording the error	12 (40)	14 (46.7)	4 (13.3)	remove	*	*
	Compulsory reporting the error	16 (50.3)	5 (16.7)	9 (30)	reassessment	reassessment	confirm
	Animosity of the reporter of error	5 (16.7)	6 (20)	9 (30)	reassessment	confirm	*
	Known reporter of error	8 (26.7)	13 (43.3)	9 (30)	remove	*	*
	Confidentiality of the error recorded	22 (73.3)	3 (10)	5 (16.7)	reassessment	confirm	*
	Recording the error by the committer	18 (60)	7 (23.3)	5 (16.7)	reassessment	reassessment	confirm
	Recording immediately after the incidence	26 (86.7)	0 (0)	4 (13.3)	confirm	*	*
Characteristic of recording the	Rewarding the error recorder	17 (56.7)	2 (6.7)	11(36.7)	reassessment	reassessment	confirm
	Punishing the error recorder	3 (10)	18 (60)	9 (30)	remove	*	*
	Plain design	28 (93.3)	1 (3.3)	1 (3.3)	confirm	*	*
	Clear design	28 (93.3)	1 (3.3)	1 (3.3)	confirm	*	*
	Comprehendible design	30 (100)	0 (0)	0(0)	confirm	*	*
	In line with the goals of care and control	30 (100)	0 (0)	0 (0)	confirm	*	*
At least of elements	Recording the time of error	28 (93.3)	2 (6.7)	0 (0)	confirm	*	*
	Recording the responsibility of the reported	22 (73.3)	4 (13.3)	4 (13.3)	reassessment	reassessment	*
	Recording the cause	30 (100)	0 (0)	0 (0)	confirm	*	*
	Recording the damage due to error	29 (96.7)	1 (3.3)	0 (0)	Confirm	*	*
media	Internet	21 (70)	6 (20)	3 (10)	Reassessment	confirm	*
	electronic	16 (50.3)	10 (33.3)	4 (13.3)	confirm	*	*
	Hospital information system	23 (76.7)	5 (16.7)	2 (6.7)	confirm	*	*

while keeping the reporter animosity and the report confidentially immediately after the incidence is desirable. In addition, rewarding the reporter in addition to having a simple and comprehensible method appropriate for the objectives to improve the care and services of health care were confirmed. Moreover, recording the time of incidence, cause and harm inflicted and the title of the person committing the error were also suggested. The result of analysis showed that using electronic and on-line media was necessary. According to experts' beliefs, the medical errors must be analyzed and the cause be identified.

In their opinion, quantitative and qualitative analysis using software, statisticians' and experts' views on medical errors is indispensable. All the experts (30, 100%) in the first stage suggested the need to analyze the medical errors. The lowest frequency of agreement was about the necessity to perform analysis by the medical record expert (14, 46.7%). The highest frequency of agreement among experts in the first stage was verbal feedback (29, 96.7%) (table 3).

With regard to the feedback provision and effectiveness of reporting the result of analysis of medical errors for reducing the errors, the need for classification based on the type of error and maintaining the confidentiality was emphasized by the experts (table 4).

Discussion:
A medical system of reporting the medical errors demonstrates the performance and capability of the hospitals or other health care centers for presenting the cares based on the safety standards (15-18). Despite the fact that voluntary reporting of medical errors leads to under reporting of the real cases of errors which in turn is considered as weakness in the system (19), nowadays such an act plays an important role in reporting the errors and increasing the safety of patient on one hand and on the other hand leads to the development and improvement of the system to reduce medical errors. For these purposes, different methods of medical error reporting are used in many countries (20-21).
The results of the present research showed that repeated error reporting, particularly, written

Table 3. Frequency Distribution of Expert Opinion about the Analysis of Medical Errors

Opinion / Item		Agree Number (%)	Disagree Number (%)	No opinion Number (%)	Result of first stage
Need to analyze		29 (96.7)	1 (3.3)	0 (0)	confirm
Cases examined	cause	30 (100)	0 (0)	0 (0)	confirm
	Reason of recurrence	29 (96.7)	0 (0)	1 (3.3)	confirm
Type of analysis	quantitative	19 (63.3)	4 (13.3)	7 (23.3)	confirm
	qualitative	26 (86.7)	1 (3.3)	3 (10)	confirm
analyzer	Statistical software	21 (70)	3 (10)	6 (20)	confirm
	statistician	17 (56.7)	4 (13.3)	9 (30)	confirm
	Medical record expert	14 (46.7)	6 (20)	10 (33.3)	remove
	Hospital's matron	16 (53.3)	5 (16.7)	9 (30)	confirm
	Expert of medical error	29 (96.7)	0 (0)	1 (3.3)	confirm

* did not have second and third stage

ones by the matrons and educational supervisors is necessary. While the use of posters and brochures are also suggested for this purpose .

Jerico suggested the use of educational intervention program to increase the incidence of medical error reports (22). The result of a study conducted in an educational hospital indicated that 54.8 percent of the physicians knew the method of reporting medical errors and only 39.5 percent of them were familiar with what errors need to be reported (23). In another study, 98 percent of the health workers were aware of the reporting system while 25 percent knew how to use these reports (24). Mcneil et al. reported that 71 percent of the medical workers were familiar with the system of error reporting (25). White et al. indicated that only 31 percent of the intern and resident students received instruction about how to complete an error reporting form (26). All these evidence show that reporting the medical errors is necessary and must be consistently performed.

The present research emphasized that recording the errors has to be obligatory, anonymous and confidential. It should also be done immediately after the incidence along with rewarding the reporter. Simple and comprehensible design, recording the time and cause of the harm in addition to the status of person committing the error were confirmed as the minimum measures of recording .

This is similar to the results of investigators that claimed the medical error reports must be confidential with no punishment consequences and unrelated to the authorities exercising punishing act in addition to being simple and comprehensible and provide the opportunity to report the incidence (7, 8, 17, 27, 28). These systems need to be designed in a way that maintains the identity of the reporter anonymously and keeps the records confidentially (27, 29). In addition, the information related to the incident should include the cause of error, the harm inflicted and the reason for the occurrence (8, 27). Some of studies in this regard suggest other information such as the date of incidence and reception of report, ward of the hospital where the event took place and the severity of incident is recorded

Table 4. Frequency Distribution of Expert Opinion about the Feedback and Reporting the Result of Analysis of Medical Errors

Opinion / Item		Agree Number (%)	Disagree Number (%)	No opinion Number (%)	Result of first stage
Goal	Error reduction	27 (90)	2 (6.7)	1 (3.3)	confirm
	Classifying errors	27 (90)	0 (0)	3 (10)	confirm
Method of maintaining	confidential	24 (80)	1 (3.3)	5 (16.7)	confirm
	Non-confidential	4 (13.3)	18 (60)	8 (26.7)	remove
Retrieval method	Non-electronic	17 (56.7)	2 (6.7)	11 (36.7)	confirm
	electronically	6 (20)	20 (66.7)	4 (13.3)	remove
Feedback results	verbal	29 (96.7)	0 (0)	1 (3.3)	confirm
	written	27 (90)	0 (0)	3 (10)	confirm

* did not have second and third stage

(19). Moreover, there are research reports that suggest punishing measure and promoting the culture are effective means of the success of reporting errors (7, 27).

However, recording time and the harms induced due to the commitment of error have been repeatedly listed (28, 30). Despite the fact that different research results have named different factors, it seems that recording the time, causes of harm and consequences of the medical errors are important factors in reporting the errors .

In addition, based on the results of the present research, the use of electronic media on-line and accessibility seems necessary. These results are in agreement with the results of research reported by Waangler et al. (5) and Bizely et al. (30), Vomhendler et al. (28) and Pearson and et al. (31) who employed a reporting system based on Web access. Considering the development of technology and its application, it is suggested to employ electronic systems for improving the treatment cares. With respect to the analysis, the expert has emphasized the use of quantitative and qualitative analysis, identifying the causes and use of software by statisticians. In addition, it was indicated that matrons and experts in medical error should evaluate the reports in order to reduce the errors. Verbal and written feedback in addition to the use of electronic media feedback was also emphasized .

In many countries, error-reporting systems to record medical errors and provide feedback for the purpose of reducing or eliminating the errors have been installed (17, 19, 32, 33, 34). Since the number of medical errors is on the rise and the presence of error detecting and reporting system provides the facility to identify and evaluate the clinical errors (35), the accumulated data must be compared instantly with the national and local data and reported to the responsible authorities (28) and feedback must be provided for the clinical mangers, heath service providers and even the patients (27). In a study conducted by Evans, 65 percent of the participants believed that lack of feedback is the biggest barrier in the reporting system and acts as an obstacle that reduces the effectiveness of these systems (24). The creation of a web site has been proposed as a means of sharing results experienced by medical error (26).

Despite the fact the separating the error system from the governmental services has a significant effect on the successful operation of the system (29) and gives it an independent system of reporting that has been noticed on many occasions, reporting the results of data analysis by experts and statisticians anonymously to the authorities is necessary (8).

It is suggested that a supervising team of experts on medical error be formed in every health and treatment center for the purpose of consistent , accurate and on-time follow –up and entire data analysis to examine and evaluate the causes of medical errors occurring in the health and treatment centers.

Conclusion:

Providing information and education are the first steps for correct recording of medical errors and improvement of treatment services. Electronic media, particularly, on-line access from different locations was suggested as the preferred medium. In addition, analysis and feedback provision were suggested as inseparable parts of a system designed to control errors.

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