The nature of errors in emergency department and the role of detectors: A qualitative study

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ARTICLEINFO	ABSTRACT
Article type: *Original article*	***Introduction:*** Understanding the nature of errors and the way errors are detected by nurses has a major role in preventing and reducing complications of errors. The present study aims to investigate the nature of errors and identify factors detecting errors in the emergency department.
	Materials and Methods: The present qualitative study was conducted with participation of 20 emergency department nurses according to Elo & Kyngas (2008) content analysis method. Data were collected through semi-structured in-depth interviews. Sampling began purposively and continued until data saturation was reached.
	Results: Analysis of data led to the extraction of two main categories, including nature of errors and error detectors. The nature of errors consisted of two subcategories, namely, lurking errors and indistinguishable of errors. Error detectors comprised four subcategories, namely, personal detectors, team detectors, client detectors, and organizational detectors. ***Conclusion:*** The present study results showed that errors in the emergency department are vague in nature and difficult to detect. Nurses use various sources to identify errors. In the context of the present study, human sources, especially nurses and patients have a key role in identifying and detecting errors. These sources of error detection should be reinforced by health organizations.

Introduction

Nursing errors occur in all hospital departments and threat patient safety (1,2). Around 4400 to 9800 patients die in hospitals every year due to errors (3). According to previous studies, 2.9% of adverse hospital complications occur in emergency departments, where 93% of these complications are preventable (1). A study conducted in Iran by Ehsani et al. (2013) showed that 46% of nurses had medication errors in the emergency department, and 72% of these errors had not been reported (4). In another study, out of 13932 errors investigated, 20% related to emergency department (2).

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This shows a high incidence rate of errors in the emergency department. The first step in preventing errors is to identify the nature of errors and how they are disclosed (5,6). Nurses have a central role in detecting errors (7). Without knowing the nature of errors and how to identify them, it is not possible to have a safe health system. However, in medical sciences, especially emergency department, very few studies have been conducted on this subject (5). There is a lack of information about strategies for error detection by nurses (8).

Identifying the nature of errors and how they are disclosed is the first step toward saving patient lives. Given the lack of information in this field, qualitative studies appear to be an appropriate solution. Thus, the present study was conducted to assess the nature of errors and identify factors detecting errors in emergency departments.

Materials and Methods

Study design
The present study aimed to investigate the nature of errors and the role of detectors in identifying errors in the emergency department, hence, qualitative content analysis method was used, which is the recommended method for the phenomena with little available information (9).

Participants and study setting
The participants in the present study included 20 emergency department nurses (12 women and 8 men) from five teaching hospitals affiliated to Shahid Beheshti University of Medical Sciences. These five hospitals had 78 emergency beds, with an average daily admission rate of 400 to 500 patients. The study inclusion criteria were willingness to take part, and at least three months of work experience in the emergency department. Participants included 14 nurses with BSc in nursing and six with MSc in nursing. Participants were aged 23-48 years (mean age 35 years). Participating nurses had between four months and 23 years of experience in emergency department (Mean 7.5).

Data collection
After explaining the study objectives and obtaining informed consents from

participants, data were collected through semi-structured interviews. Participants were selected by purposive sampling from August 21, 2014 until saturation of data on November 19, 2015. A number of questions were used as interview guide; for example: "Talk a bit about the emergency department you work in"; "What do you do in the department?"; "Have you ever come across errors?"; "Explain your own experience of error."; "What form do errors in emergency department take?"; "How did you notice your error?". A total of 22 interviews were conducted with participants, each lasting 20-60 minutes. Interviews were immediately transcribed and analyzed.

Data analysis
Data were analyzed by qualitative content analysis and according to Elo and Kyngas method (9). For analysis of data, this method suggests three stages of open coding, categorization, and abstraction. Before open coding, the transcribed interview was reviewed several times until a general understanding was obtained. In open coding stage, the text was read and assigned a code by MAXQDA.In categorization stage, the codes were compared in terms of similarities and differences, and those with the same meaning formed a category. After assessment, new codes were placed under previous categories, and categories were formed as interviews progressed. Initial categories were compared and merged (if possible) to form a common category. By the end of this stage, the researcher obtained a general understanding of the phenomenon. In abstraction stage, based on codes and contents, names that implied the contents were given to categories and subcategories.

Ethical Statement
The present study was approved by the ethics committee of XXX University of Medical Sciences under the No. sbmu2. REC. 1394.42. Before the interview, participants were briefed about the study objective, method and the use of a voice recorder, and then their written consents were obtained. Feedbacks and verbal consents were also obtained from them for continuing interviews during interviews. The participants were assured of anonymity and confidentiality of data.

Data rigor

In content analysis, assessment of data rigor and consistency is the same as other qualitative studies (9). The following steps were taken for rigor and consistency: allowing sufficient time for data collection (about 17 months), establishing adequate and appropriate rapport with participants, using participants' comments to confirm codes and categories extracted (eight participants), reviewing interviews, codes and categories by consulting and advising professors (all interviews), opinion survey from five nursing professors (alternately), maximum diversity of samples in terms of gender, age, work history, and education.

Results

Based on the analysis of data, two subcategories were extracted for the main category of "nature of error", and four for "detectors of error" (Table 1).

Table 1: Summary of categories and subcategories

Main category	Generic category	Sub-category
Nature of error	Lurking error	Possible incidence of errors at any moment
		Routineness of errors
	indistinguishable of errors	Hidden errors
		No error identification means
Error detectors	Personal detector	Recheck
		Clinical findings
		Asking questions
	Team detector	Direct observation
		Patient follow-up
		Teamwork
	Client detector	Clinical symptoms expressed by patients or their relatives
		Doubting and notifying errors
		Patient complaint
	Organizational detector	Interdepartmental communication
		Reporting error in writing
		Ward inspection and record examination

Nature of errors

Nature of errors was a main category that was formed according to the main study subject. According to participating nurses, errors in the emergency department have two important aspects, which were assigned to two separate categories, including lurking errors and indistinguishable of errors.

Lurking errors. According to participating nurses, errors are always lurking around, and may occur at any moment during care. This category consists of two subcategories, including possible incidence of errors at any moment, and routineness of errors.

Possible incidence of errors at any moment. According to participating nurses, errors may occur at any stage of care in the emergency department. A participant with 11 years of experience in emergency department stated: "Errors may occur from the time of patient admission until discharge" (personal interview).

Routineness of error. The present study participants asserted that everyone errors and the incidence of errors cannot become zero. Errors are normal in the matter of care.

A participant with five years of experience in the emergency department said: "Everyone may make a mistake, which is normal considering how busy and stressful emergency department is" (personal interview).

Indistinguishable of errors. Indistinguishable of errors was one of the Generic category formed under the main category of "nature of errors", which has two subcategories, including "hidden errors" and "no error detection means"

Hidden errors. Participating nurses argued that because of short patient stay and lack of follow-up, it is difficult to identify errors in the emergency department. A participant said: "I think emergency department errors are not very clear or outstanding ….. The bad thing in emergency is that you cannot see you commit the error" (personal interview).

No error detection means. "No error detection means" was another subcategory that was formed out of indistinguishable of errors. Participating nurses stated that there is no error identification program in the emergency department. A participant with

six years of experience in the emergency department said: "We have no computerized medication administration in the department, and we sometimes give medication to patients twice without realizing" (personal interview).

Error detectors

"Error detectors" was another main category that was formed according to the study objectives. Nurses noticed occurrence of errors in different ways. These were assigned to four Generic category: personal detector, team detector, client detector, and organizational detector.

Personal detector. This has three subcategories, including recheck, clinical findings, and asking questions. Participating nurses mostly noticed errors through recheck, clinical findings, and asking questions, which revealed the error for nurses. In most cases, recheck leaves no error-induced complications on patients. For example, a participant said: "I checked medication instructions twice, and realized that I had written Diazepam instead of Diamox on the medication form" (personal interview). Some participants noticed errors through patient's clinical symptoms. Detection of error from clinical symptoms happens when errors have already occurred and have affected the patient, but it could prevent exacerbation of complications. For example, a participant with four years of emergency experience explained: "The patient suffered itching and hot flashes after a while, and I realized my error, and stopped the medication immediately" (personal interview).

In some cases, participants noticed errors by asking questions. This is mostly used by new nurses. A participant with one years' experience in the emergency department said: "After direct IV administration of medication, I asked a colleague if I had to use infusion. Then I realized my error" (personal interview). Team detector. This was another Generic category that was formed in relation to "error detectors" category. Teamwork and communication reveal errors, and can prevent exacerbation of errors. This category has three subcategories, including direct observation, patient follow-up, and teamwork.

Direct observation of errors. This subcategory was formed out of "team detector" category. This method is mostly used when novice nurses start working in the department. Observation of error mostly happened accidentally. Participating nurses explained that errors are sometimes revealed through observation of colleagues. For example, a participant said: "I saw that my colleague had connected rinsing normal saline serum to the patient instead of injectable saline, so I immediately warned her" (personal interview).

Patient follow-up. Patient follow-up was another subcategory formed out of team detector. Participating nurses stated that patient follow-up by other colleagues' reveals errors. A participant with two years' experience in emergency department described: "For the purpose of follow-up, I asked my colleague about the dose of insulin she had injected a patient with, and she said ten units, and I said that she should have used five" (personal interview).

Teamwork. According to participants, teamwork was another factor for identifying errors in the emergency department. A participant with one years' experience in the emergency department explained: "We notice errors more when we do patient care with colleagues" (personal interview).

Client detector. This was another Generic category that was formed out of the main category of error detector. According to participating nurses, the presence of patient's relatives in the emergency department and their statements count as a source of error disclosure, especially when the department is busy. This category consisted of three subcategories, including clinical symptoms expressed by patients or their relatives, doubting and notifying errors and patient complaint.

Clinical symptoms stated by patients or their relatives. Participants said that sometimes patients or their relatives state certain symptoms that revealoccurrence of an error. A participant said: "A patient's relative told me their patient had come out with a rash, and I went over and saw that vancomycin had gone too fast, and caused an allergic reaction" (personal interview).

Doubting and notifying errors. This was another subcategory formed in relation to

the Generic category of client detector. A participant said: "When I went to administer a patient's medications, he said that he did not have this medication before, so I checked and realized that I had taken the wrong medication" (personal interview).

Patient complaint. In rare cases, the patient's complaint to legal authorities reveals occurrence of an error. A participant described: "A patient had complained about a doctor's conduct, and during investigation, an error committed by a nurse was also revealed" (personal interview).

Organizational detector. This was another Generic category that was formed out of error detector. Occasionally, organizational procedures lead to detect of errors.

This category consisted of three subcategories, including interdepartmental communications, reporting errors in writing, and inspection of department and records.

Interdepartmental communications.

Participating nurses stated that some nursing errors were identified when a patient was transferred to other wards, and this was mostly reported to the nursing office, which informed organizational authorities about the errors. A participant explained: "At patient handover to the internal ward, we realized that his blood sample had not been sent for culture, and antibiotics had been administered .... The ward head nurse reported this error to the nursing office" (personal interview).

Reporting errors in writing. On certain occasions, a written report of an error by nurses reveals occurrence of an error at the organizational level. A participant stated: "In our department, the vials of Ranitidine and Lasix were similar; they were both dark and one was mistaken and administered for the other. This was reported to the nursing office, and hospital management became aware of the error. A letter was sent to the wards to prevent this error" (personal interview).

Ward inspection and examination of records. This was another subcategory that was formed from the Generic category of error detectors at the organizational level. Some errors are identified by supervisors' inspection of wards and examination of records. A nurse explained: "A patient has problems (dies), another goes to the

mortality committee, and another to the coroner, where examination of records reveals our error" (personal interview).

Discussion

The present study was conducted to investigate the nature of errors and identify factors detecting errors in the emergency department. The results obtained showed that errors have a vague nature in the emergency department, and nurses use different measures to detect errors. Identifying an error prevents its exacerbation and evokes nurses' reaction.

Given patient safety, errors may occur at any moment (10). According to the present study results, errors are vague in the emergency department due to short patient stay and overcrowding. Vagueness of errors due to short hospital stay is a problem in the emergency department (11). The hidden nature of errors prevents nurses' reaction to that error. A study conducted by Valiee, Peyrovi, and Nikbakht Nasrabadi (2014) regarded inevitability of errors in intensive care units as the nature of errors (12). However, vagueness of errors has not been referred to in studies by Valiee, Peyrovi, and Nikbakht Nasrabadi (2014), Crigger& Meek (2007), Stetina, Groves, and Pafford (2005) (12-14).

It appears that vagueness of errors due to short patient stay in the emergency department is more pronounced, and specific to the emergency department. Vagueness of errors in the emergency department due to short patient stay was mentioned in a study by Kane-Gill et al. (2012) (11). This vagueness of errors plus a lack of a monitoring system leads to non-identification of error and adverse consequences for patients and the health system. Thus, nurses and health system should pay particular attention to identifying errors in the emergency department. Identifying errors is the first step in correction and reducing complications of errors, without which, errors will not be corrected (13).

Nurses use different sources for detecting errors, namely, personal detector, team detector, client detector, and some sources at organizational level. At personal level, errors are detected through rechecking

medical instructions and reports, where nurses notice an error by doubting and rechecking and try to correct that error. A study mentioned recheck as a method to identify errors, used by nurses to prevent them (15). According to nurses, clinical symptoms are one way of identifying errors, which has been also reported in other studies (16,17).

But, in this method, the error has already affected the patient, and disclosing the error prevents exacerbation of complications, and nurses try to correct the error. Asking questions was a method mostly used by less-experienced nurses to identify errors. Other studies have also referred to asking questions as an error disclosing source (7). In a positive working atmosphere, novice nurses have greater opportunity for asking questions (18).

Asking questions and communicating with colleagues can lead to disclosure of errors and reduce complications. In a study conducted by Henneman, Blank, Gawlinski, & Henneman (2006) nurses noticed errors by supervision, prediction, recheck, and experience (19).

Another source of identifying errors is through providing care as a team, which makes nurses notice an error by direct observation and follow-up, and take measures to correct the error. Previous studies have cited planned observation as a means of identifying errors (20,21).

But, in the present study, observation of errors by colleagues was accidental. Teamwork increases the opportunity for observing and disclosing errors. Previous studies have confirmed the presence of teamwork in providing cares. Previous studies have shown that teamwork reduces the incidence of errors (22,23). Accordingly, the infrastructure should be provided for better interaction of team members, and change of functional and per case methods to teamwork. Because the department is overcrowded, in most cases, nurses are unable to properly assess patients. Patients and their family can act as a source for identifying errors. According to previous studies, 20% to 42% of patients were aware of errors incurred on them (24,25). Thus, nurses should improve their interaction with families as members of the medical team, and further reinforce this source of identifying errors. Previous studies have also cited the fact that the recipient of care is a source for identifying errors (7).

A number of sources detector errors at the organizational level, which results in organization's reaction to that error. These include department inspection and examination of records, written reporting of error by the culprit nurse and interdepartmental communications. Other studies have referred to the system as a source for revealing errors (26,27).

At the organizational level, errors are identified when they have already left their mark. Identifying errors at organizational level can prevent future errors, as the organization can correct sources of error.

Limitation

Due to the qualitative research method used in our study the findings are not generalizable

Conclusion

Errors are a threat to patient safety. Errors have a vague nature in the emergency department and can be hardly identified. Errors can have irreversible consequences for patients' health and incur costs on the health system.

However, nurses take measures to identify errors. In the context of the present study, human sources have a major role in identifying errors, but these sources appear to be insufficient. In some cases when errors are not identified, they can worsen the harm to patients. Therefore, along with reinforcing these error detection sources, the health system should use well-designed systems and computer programs to avoid errors and prevent exacerbation of its complications.

Acknowledgments

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