

## Prevalence and Types of Medical Errors at a Trauma Center in Isfahan, Iran (2018-2019)

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ARTICLE INFO	ABSTRACT
<p><b>Article type:</b> Original Article</p> <hr/> <p><b>Article History:</b> Received: 03-Apr-2020 Accepted: 20-Jun-2020</p> <hr/> <p><b>Key words:</b> Medical error, Prevalence, Trauma.</p>	<p><b>Introduction:</b> Clinical errors can affect patient safety, reduce the quality of care, or even cause irreparable harm to the patients. Attention has been primarily tended to be directed toward medication errors; accordingly, limited focus has been placed on other clinical errors, such as caring, therapeutic, and blood transfusion errors. Regarding this, the present study was aimed to perform a comprehensive investigation of the type and prevalence of different clinical errors in a teaching trauma hospital.</p> <p><b>Materials and Methods:</b> This descriptive study was targeted toward the evaluation of the types and frequency of medical errors in the Trauma Center of Ayatollah Kashani Hospital in Isfahan, Iran, during 2018 and 2019. The data were collected using a clinical error reporting form, covering such data as the type of error, error severity, and associated ward. The data were analyzed in SPSS software, version 16.</p> <p><b>Results:</b> A total of 375 errors were reported, the majority of which were related to imaging and radiology domains (26.7%), followed by laboratory and blood bank (22.9%). In terms of job position, nurses (42.6%) and physicians (29.5%) made the majority of the errors. Furthermore, most of the errors occurred in the morning shifts (57.3%) and at the hospital emergency department (28.9%).</p> <p><b>Conclusion:</b> According to the results of the present study, the emergency department requires more attention to reduce the documentation errors of radiology and imaging.</p>
<p>► <b>Please cite this paper as:</b> Toghian Chaharsoughi N, Nasr- Esfahani M, *Sodoury MS. Prevalence and Types of Medical Errors at a Trauma Center in Isfahan, Iran (2018-2019). <i>Journal of Patient Safety and Quality Improvement</i>. 2020; 8(2): 85-91. Doi: 10.22038/psj.2020.47570.1269</p>	

### Introduction

An error is a defect in a pre-planned action that occurs due to making a wrong plan to achieve the goal (1). Errors usually occur

because of human errors and poor designs of the health care system (2). The simplest to most complex activities in the clinic may be accompanied by errors (3), which are accompanied by specific financial and

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clinical outcomes for health systems in different countries (4) and reflect the presence of deficiencies in the health care system (1).

According to the literature in spite of advances in sciences and technology 3% - 17% of patients admitted to hospitals suffers from medical errors (5). Other research has reported similar rates, suggesting that clinical errors occur in 3 to 11 percent of hospitalized patients, although direct observational studies report a higher incidence, amounting approximately to 17.7% (6). However, more than half of these errors can be prevented (4,6). Based on the statistic in developing country such as Eastern Mediterranean region about 4.4 million medical errors occur annually at therapeutic center (7). According to the studies approximately 100/000 patient are killed due to preventable medical errors every year in U.S. (8). Based on a review study, the rate of medical errors was estimated at 52 per 100 hospital admissions in developed country (9). Medical errors in Iran do not have specific statistics However, according to published information, for every 100 to 150 patients admitted to hospitals, one patient dies due to medical errors(10). Most studies in Iran have focused on medication errors, while other errors (care, treatment, recording, blood transfusions, etc.) have received less attention (1,11,12). Given the importance of clinical errors and their impact on patients, a first step in identifying and controlling errors is to report and record them (3). Clinical errors can threaten patient safety (3,12) and may lead to reduced quality of care and, in cases, irreparable harm to the patient (11).

Despite the efforts made to reduce errors, they still occur in clinical settings (12). One of the key components for improving patient safety is to report the occurrence of accidents and errors (5). In Iran, little attention has been directed to other error types that may occur in the clinic for the patient, including care, treatment, blood transfusion, and recording errors, among others (12). On the other hand, it is a challenging task to obtain accurate data on clinical errors as studies have reported varying ratios. Hence, identifying the types

of clinical errors can significantly reduce the incidence of similar errors and their associated consequences (4). Moreover, as it is known, teaching-treating centers are highly prone to a wide spectrum of medical errors given that medical students are being trained in these settings. Ayatollah Kashani Hospital of Isfahan is no exception to the rule because of the special conditions that it holds, including its teaching nature for nursing students, general practice students, and emergency medicine assistants. The situation would be more complicated to know that it is the largest trauma center in the province, making it by far more prone to errors for both nurses and physicians when operating in critical situations (i.e., traumas and accidents). Therefore, a thorough understanding of the type and frequency of errors occurring in this hospital is essential and also crucial for the staff at this center and other centers with similar conditions, given the importance of patient safety and the learning from errors. Thus, this study aimed at investigating the type and rate of clinical errors in this teaching-treating trauma hospital to yield a more accurate and complete assessment of errors.

## Materials and Methods

This is a descriptive study based on a research project with the code of ethics IR.IAU.NAJAFABAD.REC.1397.060 and was performed in Ayatollah Kashani Hospital in Isfahan province in 2019. Ayatollah Kashani Hospital is the largest trauma center in Isfahan province, with a high rate of emergency referrals due to a variety of incidents and accidents. Moreover, the hospital is affiliated with Isfahan University of Medical Sciences and is one of the teaching-treating centers where professionals are trained for clinical practice. This study initiated and was allowed to have access to error statistics upon referral to the hospital's clinical governance office and presenting the ethical code.

The research tool was a clinical error reporting form that collected information on age, sex, education, work experience, and the job position of the error-reporting individual as well as a description section for error report, ward's name, work shift, and

classification of the error type in terms of severity of harm. Completion of the section for the error-reporting individual was optional and if completed by the error-reporting person, it was treated as confidential. Adverse events are classified according to the severity of the harm. Types of clinical errors in terms of severity include near-miss events, incident events, accident events, and sentinel events (1). The Provincial Vice-chancellery of Treatment has approved this form. In addition, the form was used in a pilot study and was revised and approved by stakeholders familiar in the error reporting culture, including the hospital's nursing services manager, education supervisor, patient safety specialist, accreditation and quality improvement specialist, treatment vice-chancellor, education vice-chancellor, and hospital presidency and management. Moreover, Mohammadalizadeh et al. used this instrument in their study in 2016 (1). The staff, including the nurses, physicians, and the paraclinical personnel (laboratory, pharmacy, imaging, physiotherapy) were trained through one same educational workshop held in the hospital on four different occasions. The instructional contents concerned with the manner to complete the forms, the way to report them to the patient safety specialist, and the types of errors. The sessions were held on different occasions so that the staff could participate in any work shift that they might have been. To facilitate the easy reach of the staff to error forms, the forms were duplicated in sufficient numbers and placed in different wards. Besides, with the collaboration of the hospital computer unit, it was made possible to record forms online so that one could easily report errors if the person did not intend to submit a form in person. Also, three patient safety boxes were prepared and installed on busy routes, including the emergency department, entrance to the wards, and somewhere close to the hospital staff attendance device so that the staff could report errors conveniently. In case a staff member noticed an error made by a colleague or if they themselves made a mistake, they were supposed to complete the error report form and deliver it to the safety expert. As the

forms were designed to have no place to mention a name, whether that of the error-maker or its reporter, any person could easily complete the form without any problem or fear and give it to others so that others may be alerted against committing a similar mistake. Moreover, to observe ethical considerations, the target population was assured of the confidentiality and anonymity of contributions and the fact that there was no need to cite one's own or the error maker's name on the report forms. Moreover, there was no repent or reprimand for reporting errors given the underlying purpose of promoting the patient safety culture and error reporting practice. In the course of the study, the training course was reiterated for newly employed staff. These forms were distributed, collected, and analyzed for a period of one year. If an error was reported more than once, the extra items were deleted and then the data was analyzed. Descriptive statistics were used for data analysis using the SPSS 16 software.

**Results**

Based on the results, out of the 375 errors reported, the majority of the cases were related to imaging and radiology domains, (26.7%) followed by laboratory and blood bank (22.9%). The frequency of errors is enlisted in (Table 1).

**Table 1:** Frequency of clinical errors based on the type of error

Type of error	Number	Percentage
Medical	43	11.5
Care	53	14.3
Medication	67	18.1
Blood and blood products	21	5.7
Patient identification	2	0.5
Laboratory and blood bank	85	22.9
Medical equipment	1	0.3
Radiology and imaging	99	26.7

The frequency of the job position of the individuals making an error showed that nurses (42.6%) and physicians (29.5%) made the majority of errors (Table 2).

**Table 2:** Frequency of error reporters based on the job position

Position	Number	Percentage
Medical equipment unit personnel	5	1.3
Pharmacy personnel	30	8
Laboratory and blood bank staff	39	10.4
Physician	110	29.5
Nurse	159	42.6
Radiology and imaging unit personnel	19	5.1
Nursing student	1	0.3
Nurse assistant	7	1.9
Receptionist	3	0.8

Furthermore, most of the errors occurred in the hospital emergency department (28.9%), followed by the intensive care unit (26.5%; Table 3).

**Table 3:** Frequency of errors as per para clinical unit and ward

Ward	Number	Percentage
Emergency	107	28.9
Intensive care	98	26.5
Otolaryngology	26	7
Operating room	19	5.1
Orthopedics	38	10.3
Surgery	32	8.6
Trauma	21	5.7
Internal neurology	1	0.3
Pharmacy	1	0.3
Imaging and radiology unit	1	0.3

The highest error rate (38%) was reported in the third quarter of the year. In terms of work shifts, the errors occurred more frequently in the morning shifts (57.3%), followed by the night shifts (22.4%; Table 4).

**Table 4:** Frequency of errors as per work shift

Type of shift	Number	Percentage
Morning	207	57.3
Evening	73	20.2
Night	81	22.4

Concerning the degree of harm to patients, the most common type of error was type II error (67.8%), incurring no damage to patients. In addition, most of the error reporters were nurses (46.3%) with a work experience of  $14.75 \pm 8.1$  years. Physicians were the least likely group (0.5%) to report hospital errors. The comparison of medical and nursing group errors showed that the highest rate of errors made by physicians (43.5%) in the emergency department when requesting for radiographs and computed tomography scans (52.8%). The radiology and imaging staff reported the majority of these medical errors (46.7%). Such errors occurred mostly in the third trimester of the year (36.4%) in the morning shift (59.8%) and were primarily incident events in terms of severity (41%). In the nursing group, the highest error rate (33.8%) occurred in the emergency department, while the highest rate was related to laboratory errors (34.2%), including inaccuracy in the transfer of the right sample, wrong sampling, and incorrect labeling on the sample. These errors also occurred mainly in the third quarter of the year (39.6%) and the morning shift (46.3%). In terms of the severity of harms, the errors were primarily incident events (79.6%). Most of those who reported this type of nursing errors were laboratory and blood bank staff (38.2%). The frequency of the errors made by the physician and nursing groups is summarized in (Table 5).

**Table 5:** Frequency of medical and nursing group errors

Type of error	Nursing group (%)	Physician group (%)
Medical	0	38
Care	22.8	5.6
Medication	21.5	2.8
Patient identification	0.6	0.9
Laboratory and blood bank	34.2	0
Blood and blood products	7.6	0
Radiology and imaging	13.3	52.8
Total	100	100

## Discussion

The results showed that out of the 375 errors reported, 107 cases occurred in the emergency department. In the same vein, in a study performed by Khammarnia et al., a large percentage of errors were related to the emergency department (10). The large number of errors in the emergency department can be explained by the crowdedness of the department, frequent referrals, work overload, patient conditions, and physician exposure to various clinical conditions that make the clinical practice unsafe (4,13). Given the special conditions of Ayatollah Kashani Hospital as the trauma center of the province with many referrals, most of which are due to trauma and accidents, patients and their companions usually come to the emergency room with inappropriate mental and physical conditions (14). This can cause mental distress in nurses and physicians, thereby complicating the working conditions and increasing the probability of the incidence of errors (15). In this study, the highest rate of errors was related to radiology and imaging recording domains. The results of this study contradict the findings obtained in the previous research, in which the highest error rate belonged to medication errors (16). In this regard, in the studies carried out by Rezazadeh et al. in 2012 and Shoja et al. (17,18), medication errors were reported to have the highest clinical rate (17). In a study performed by Shoja et al., this rate was obtained as 36%. Many studies have addressed medication errors in recent years. The significance of such research is already evident to most of the care providers. However, non-medicinal errors, including those related to paraclinical wards, have not been well addressed and may have been considered less significant (12). Ayatollah Kashani Hospital is a trauma center, according to the emergency medicine protocols of which X-rays and computed tomography scans are taken for most of the patients referred to this hospital to check for fractures and brain injuries. As there are a large number of requests to assess the patient current status and compare it with his/her subsequent status, a higher rate of imaging error was reported.

Regarding the rate of hospital staff participation in reporting errors, the results indicated that nurses had the highest rate of collaboration, while the physicians had the least cooperation. Given that the educational value of reporting errors to prevent further recurrence is a patient safety requirement and part of the safety culture (19), nurses seemed to show more insight into this issue and were more involved in error reporting to avoid the commitment of similar errors and improve patient safety. This finding is in line with the results obtained by La'l et al. in 2016, showing the significant contribution of nurses ( $P < 0.03$ ) to error reporting and patient safety culture, compared to that of physicians and other hospital staff (20). Similarly, in another study performed by Khamnyar et al., nurses (67.3%) were more likely to report errors than physicians (20.2%) (10). In terms of the severity of harms to patients, the highest rate of error was related to incident events (67.8%). This is consistent with the findings reported by Mohammadalizadeh et al. in 2016, where the rate of incident events was higher than those of other types of error amounting to 36% (1). The error rate recorded showed that most of the errors occurred in the morning shift, which is similar to the results obtained by Khammarnia, reporting the highest error rate in the morning shift (55%) (10). With regard to the volume of hospital activities in the morning shift, it can be pointed out that the hospital workload in the morning shift is higher than that of the evening shift. However, in a study carried out by Mohsenzadeh, the greatest number of errors occurred during the night shift (21). The difference may be due to the type of hospitals under study.

## Conclusion

According to the results of this study, most of the errors were related to the radiology and imaging units, followed by the laboratory, and were mostly of the recording error type. These errors occurred most frequently in the emergency department, in the morning shift, and by nurses and physicians. Therefore, it seems that the emergency department of this trauma center needs the direction of further attention when recording the request for an X-ray and a computed

tomography scan, as well as blood tests, to prevent the incidence of errors. It is because these errors not only incur excess costs and waste the time but also cause serious problems in the diagnosis, treatment, and care of patients, whereby patient safety may be threatened.

### Acknowledgments

We are very grateful to the management and staff of the Quality Improvement Unit and the staff of Ayatollah Kashani Hospital of Isfahan who assisted us in performing this study.

### Ethical considerations

In order to adhere to the research ethics principles, it was explained to the staff that there was no need to mention the name of the error-reporting individual neither through the online reports nor through the in-person ones. The results of the study were published in total, and the forms were examined confidentially. The managers of the center were assured that the error reports were aimed only to prevent the incidence of similar errors and that there would be no reprimand or written punishment or intentions to dock the staff's pay.

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