

medical condition and feel anxious about their diagnosis and prognosis. They are also concerned about whether there is a need for paraclinical and laboratory evaluation. Some authorities have come across people who demanded additional information even after being provided with a clear diagnosis based on cancer screening..

Tsuboi et al. showed that interaction between health providers (including physicians), on the one hand, and patients and their family members, on the other, could achieve the outcome peacefully (11). In the case of a patient in his forties in an advanced stage of cancer, daily visits to explain the situation and laboratory results to the patient and his family seemed to help the family cope with the ordeal, and finally come to terms with the patient's death.

Nagura et al attempted to explore the feelings of elderly patients and their families regarding the patient's disease, and concluded that if patients are informed of the terminal nature of their disease, they are less likely to have false expectations (12). As rightly pointed out by Schreiber in 1988, "neither rigorous truth at any cost, nor the principle of concealment of the hopelessness for (sic) the patient's condition is correct" (13). It is globally accepted that one needs to strike a balance between these two extremes, considering the emotional state of the patient and the family (13,14).

In a study carried out by Habeck et al in Germany, it was found that 77.7% of the 1043 respondents wished to know the causes of their complaints, whilst 66.4% were in favour of knowing the prognosis (15). The majority of the respondents preferred that their family doctor explain their case to them, rather than their going through the report themselves. Around 90% of those who participated in this study wanted to be fully informed about their condition.

In conclusion, while it may be difficult to explain the truth completely in some societies and cultures, the findings show that there is a general tendency among patients and their families to wish to be told about the patient's condition, particularly by the attending physician. When considering disclosure of the patient's condition, it would enhance the

patient's and his/her family's emotional well-being if the physician tried to maintain a balance between what might make them feel hopeful and hopeless.

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# Medical error and related factors during internship and residency

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## Abstract

*It is difficult to determine the real incidence of medical errors due to the lack of a precise definition of errors, as well as the failure to report them under certain circumstances. We carried out a cross-sectional study in Kerman University of Medical Sciences, Iran in 2013. The participants were selected through the census method. The data were collected using a self-administered questionnaire,*

*which consisted of questions on the participants' demographic data and questions on the medical errors committed. The data were analysed by SPSS 19. It was found that 270 participants had committed medical errors. There was no significant difference in the frequency of errors committed by interns and residents. In the case of residents, the most common error was misdiagnosis and in that of interns, errors related to history-taking and physical examination. Considering that medical errors are common in the clinical setting, the education system should train interns and residents to prevent the occurrence of errors. In addition, the system should develop a positive attitude among them so that they can deal better with medical errors.*

## Introduction

Medical errors are considered deviations from the process of care, and they may or may not cause harm to the patient (1).

It is difficult to determine the real incidence of medical errors because there is no precise definition of such errors and also, because all medical errors may not be reported (2). Medical errors have important consequences, which are underestimated. As a result, there is an absence of targeted corrective measures (3).

It is estimated that in developed countries, as many as one in 10 patients is harmed while receiving hospital care (4). It is clear from this that medical errors would be a significant problem in developing countries. A study in Imam Khomeini Hospital, Tehran, Iran, found that the occurrence of serious, minor and near miss errors per 100 patients was 0.84, 2.55 and 5.07, respectively (5).

Medical errors can be caused by different factors. These factors may occur in any part of the programme for the patient's care, and mainly include poor communication with the patient, misdiagnosis, health personnel with inadequate experience, working in an extremely busy setting, and dealing with complicated cases (2). Another study found that among interns, "extended-duration work shifts increase the risk of significant medical errors and adverse events (AEs)" (6). Whatever their cause, errors can greatly increase the expenses incurred by patients and be life-threatening. The incidence of death in patients with AEs has been reported to be 4.4% (7). AEs account for a substantial part of the national healthcare budget (8).

Given that medical errors can have irreversible effects (on the patient, system and even health personnel), it is the responsibility of healthcare systems to identify the frequency and common types of errors. This would make it possible to plan preventive programmes to reduce the occurrence of errors. According to our search, the number of studies in Iran investigating the frequency and type of medical errors is limited. Most of them cover all health professionals, including nurses, general practitioners and specialists, and do not specifically focus on trainee doctors. Moreover, the majority of them address medication errors.

Due to the heavy workload of medical interns and residents, we decided to study the frequency of medical errors and related factors as reported by them in Kerman University of Medical Sciences (KUMS). Now that we have gained an understanding of the issue, it is possible for our system to plan educational programmes aimed at minimising the problem of medical errors.

## Materials and methods

This cross-sectional study was carried out in KUMS between April and September 2013. KUMS is a public institution located in the Kerman province in southeast Iran. The census method was used to select 332 medical interns and residents. The list of their names was taken from the deputy of education. The data were collected using a self-administered questionnaire, consisting of two sections. The first section consisted of questions on demographic data, such as age, gender, and current educational level (internship or residency) and the duration of study. The second part consisted of four questions framed on the basis of structured literature review. In the literature, we found studies on self-reported errors by trainee doctors. The questions were about whether the respondents had committed medical errors previously; the type of error (related to history-taking, physical examination, diagnostic procedures, treatment, education of patients and follow-up care); the severity of errors; the resultant complications among patients (serious and life-threatening, not serious, without any complication); and the respondents' reactions to the errors (feeling distressed, angry, depressed, fearful, more or less willing to work than before, and forgetting about the error). These reactions are called the "second victim" phenomenon. A second victim is a healthcare provider who suffers from psychological complications after being involved in a medical error (9).

The validity (face and content) of the questionnaire was confirmed by a group of six faculty members and five residents. Its reliability was determined by a pilot study. The questionnaires were distributed among the respondents and completed by them after the morning report session or through e-mail.

The respondents were given 15 minutes to fill in the questionnaire, which was completed anonymously and voluntarily. The trainees were assured that the data would be used only for research purposes. The study, including the questionnaire, was approved by the research review board at KUMS. The data were analysed using SPSS version 19. The frequency distributions of responses were calculated and compared using the two-tailed Fisher's exact test or chi square statistic. Logistic regression was used to determine significant predictors of the committing of errors.

## Results

A total of 293 questionnaires were completed (response rate of 88.2%). Of the respondents, 130 (51%) were males and 111 (38%) interns. The median age of the interns and residents was

25 and 31 years, respectively, while the median time spent at the current educational level for the two groups was 6 and 13 months, respectively. A total of 270 respondents (92.1%) stated that they had committed medical errors while at their current educational level.

**Table 1**  
**Factors related to committing medical errors**

Variables	B	S.E.	Pvalue	Exp(B)	95% CI for EXP(B)	
					Upper	Lower
Age	0.65	0.12	0.31	1.07	0.84	1.34
Sex	-0.27	0.49	0.65	0.80	0.30	2.1
Educational level	-0.77	0.79	0.92	0.92	0.19	4.39
Duration spent in current training (internship / residency)	0.71	0.30	0.02**	1.07	1.01	1.14

\*\*p value<0.05

There was no significant difference in the self-reported frequency of errors committed between the interns and residents, or between males and females, ( $p>0.05$ ). Table 1 shows the factors related to medical errors, using the logistic regression model. According to the table, the longer the duration of time since the beginning of the training (internship / residency) the greater the likelihood of medical errors ( $p=0.02$ ). Among the residents, the most common error was misdiagnosis (54%), followed by errors related to treatment (49%), history-taking and physical examination (48.5%), follow-up care (22%) and education of patients (18.3%). Among the interns, errors related to history-taking and physical examination (75.2%) were the most common, followed by misdiagnosis (43.5%), errors related to treatment (36.6%), follow-up care (31%) and education of patients (13%). As the respondents were allowed to choose more than one item, the total was more than 100%. There was no statistically significant difference between interns and residents in the frequency of type of error ( $p>0.05$ ), except for errors related to history-taking and physical examination ( $p=0.001$ ) and follow-up care ( $p=0.04$ ), which were more frequent among the interns. Five (2%) respondents (3% of interns and 1.2% of residents) stated that the errors they had committed had caused serious, permanent and even life-threatening injury to the patients. One hundred and one (37.5%) (20% of interns and 48% of residents) said their error had caused injury which, however, was not serious or life-threatening, while 162 (60.5%) said the error committed by them had not caused any complication.

The respondents' most common reaction after committing an error was a feeling of distress (63%). This was followed by an increased willingness to work (30%), fear (25.6%), depression (17) decreased willingness to work (13.3%), forgetting the event (error) (12.2%), and anger (3.3%) (The respondents were allowed to choose more than one option). There was no significant difference between the frequency of these reactions among the interns and residents, except when it came to distress, which occurred with greater frequency among the

residents, and depression, which affected the interns more frequently (Table 2).

**Table 2**  
**Comparison of trainees' reactions after committing errors according to educational level**

		Educational level		p value
		Interns	Residents	
		Number (%)	Number (%)	
Increase in willingness to work	No	70 (69.3)	119 (70.4)	0.84
	Yes	31 (30.7)	50 (29.6)	
Decrease in willingness to work	No	89 (88.1)	145 (85.8)	0.58
	Yes	12 (11.9)	24 (14.2)	
Forgetting about the error	No	90 (89.1)	(87.0) 147	0.60
	Yes	11 (10.9)	(13.0) 22	
Depression	No	75 (74.3)	149 (88.2)	0.003
	Yes	26 (25.7)	20 (11.8)	
Distress	No	45 (44.6)	55 (32.5)	0.048
	Yes	56 (55.4)	114 (67.5)	
Fear	No	73 (72.3)	128 (75.7)	0.52
	Yes	28 (27.7)	41 (24.3)	
Anger	No	99 (98.0)	162 (95.9)	0.33
	Yes	2 (2.0)	7 (4.1)	

The frequency of these reactions was not affected by the severity of the consequence of the error ( $p>0.05$ ).

## Discussion

Our study revealed that the frequency of self-reported medical errors was high (92.5%). In a study by White et al, 98% of residents and 79% of fourth-year medical students reported having committed errors (10).

Kroll et al found that junior doctors commonly commit and witness errors, some of which are serious (11). A study carried out in Zabol (a city in southeast Iran) found that 72.5% of general physicians had committed medical errors (12).

Another study in Iran revealed that the maximum medical errors were committed by medic works staff (a category of paramedical hospital staff in Iran) (25.2%), followed by interns (21.2%), nurses and general practitioners (17.2%), the pharmacy (11.3%) and specialists (7.9%) (13). Our study did not reveal any significant difference in the number of self-reported errors between interns and residents, or males and females. Not many studies have discussed this particular issue. This finding possibly indicates that medical errors occur regardless of gender and educational level. According to our results, the longer the duration of time since the beginning of the training (internship / residency), the greater the likelihood of medical errors. As the health workers' contact with patients grows, they gain greater experience and competence, and thus come to pay greater attention to their performance. This can increase the likelihood of being able to recognise one's errors. White also showed that personal involvement with medical errors increased with the level of training (10).

In our study, misdiagnosis was the most common type of error committed by residents. Factors such as relatively heavy

responsibility for the care of patients and the diagnosis and treatment of their ailments, as well as extended work shifts could lead to the higher frequency of this type of error. In teaching hospitals with residency training programmes, interns have no direct responsibility for the care of patients and work under the supervision of residents. All of our teaching hospitals affiliated to KUMS have residency training programmes. On the other hand, in teaching hospitals, interns have to take greater responsibility in history-taking and physical examination, which perhaps accounts for the fact that they commit more errors in these areas.

Despite the high frequency of medical errors reported by the respondents, only a small percentage (1.2%–3%) stated that their errors had caused serious, permanent or even life-threatening injury to the patient. In the study by White and colleagues, 32% of surgical interns and 60% of surgical residents stated that their errors had caused serious injury to the patient (10). Compared to White's study, the frequency of serious consequences following errors was lower in our study. This difference may be attributed to the fact that the two studies were carried out in different settings. Our study was carried out in all clinical departments, whereas White's study reported on the consequences of errors in the surgery department. In this setting, the probability of errors is higher and the consequences of the errors may be more serious. Another reason for this difference between the two studies may be that our trainee doctors underestimated the consequences of their errors.

We also evaluated the participants' reactions to the medical errors committed by them. The reactions include what is called the "second victim" phenomenon. This phenomenon was described by Albert W Wu in 2000. He believed "although patients are the first and obvious victims of medical mistakes, doctors are wounded by the same errors: they are the second victims" (14). Scott et al revealed the natural history of recovery for the healthcare provider as second victim after being involved in medical error (15).

Seys et al revealed in a systematic review that the prevalence of this phenomenon varied from 10.4% to 43.3%. The reactions that commonly occur after committing errors are emotional, cognitive or behavioural (16). In our study, all participants who had committed errors at their current educational level reported that they experienced psychological symptoms. The most common reaction was distress. The other reactions were an increase in the willingness to work, fear, depression, a decrease in the willingness to work, forgetting about the error, and anger. According to the participants' statements, the residents felt more distressed than the interns, while the interns felt more depressed. The frequency of these reactions did not vary according to the severity of the consequences of the error. This indicates that healthcare providers can suffer psychologically even in the case of minor errors and errors that do not give rise to any complications. We need to have support systems to protect both the patient and the healthcare provider (16).

It is the responsibility of the education system to train medical students on medical errors, how to deal with them and the value of reporting them in a timely fashion. However, most medical curricula include no such training. The issue of medical errors is a sensitive one because it has a bearing on the life and well being of patients. Further, the health system spends a lot of time and money on this account. So, the educational system should equip students to prevent the occurrence of medical errors, as well as help them develop a positive attitude to enable them to deal with such errors. Finally, it is clear that the authorities and policy-makers have a critical role to play by enacting legislation to create a sense of moral and legal responsibility for healthcare personnel, which induces them to make timely disclosures of errors to patients and supervisors.

## Conclusion

According to our study, medical errors were committed commonly in the setting of clinical training. Educational programmes should pay more attention to equipping trainee doctors to minimise the occurrence of errors. We should revise the educational programmes of the undergraduate and postgraduate levels and consider holding training workshops on ethical issues related to medical errors. Another strategy is to develop a support system for patients as the first victims, and to help trainee doctors as the second victims, so as to minimise error consequences.

## Limitations

Our study was a cross-sectional one. Another limitation was that the data collected was self-reported by the trainees, which does not necessarily yield precise evidence. The trainees may have underestimated the frequency of the medical errors committed by them, or may have underestimated their consequences. In addition, with the passage of time, they may have forgotten their actual reactions following the errors.

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