

Common Medical Errors in Gastroenterology: A Mixed Method Study

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ARTICLE INFO	ABSTRACT
<p>Article type: Research Paper</p>	<p>Introduction: Medical mistakes cause injury to patients and raise the expenses of treatment and hospital stays. The current study aimed to identify medical errors in the field of gastroenterology and propose a prevention strategy.</p>
<p>Article History: Received: 17 Aug 2023 Accepted: 23 Jan 2024</p>	<p>Materials and Methods: The study was carried out through a mixed method (quantitative, qualitative) in a sequential manner. In the first stage (quantitative), common errors in the department were identified. In the second stage (qualitative stage), data gathering was done by interviewing nurses and doctors. The collected data was analyzed using content analysis method and error prevention strategies were identified.</p>
<p>Key words: Medical Error; Medication Error; Patient safety; Gastroenterology.</p>	<p>Results: The mean (standard deviation) score of patients in the departments were 66.28 (98.7), and the mean number of nurses was 4.83 (26.3). It was found that the most medical errors were not serious, and the most errors in drug registration were drug card registration (42.9%), drug preparation (38.1%), and drug prescription (33.3%). Medical errors resulting in severe complications due to incorrect patient identification accounted for 2% of the total errors. The suggested prevention strategies included: adjusting department supervision processes, ensuring proper training, enhancing patient education, and developing a culture of error reporting</p> <p>Conclusion: The study's findings revealed a high frequency of errors that were largely benign and identified before they occurred. Nevertheless, given their potential to inflict harm, it is essential to implement effective error detection and reporting system.</p>

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Introduction

Medical errors (MEs) are one of the most critical challenges in health systems and they are a major threat to patient safety (1). Medical errors also increase overall hospitalization costs (2) and are one of the main factors in the quality of hospital services, especially in the developing countries (3). It is estimated that 50% of hospitalized patients are threatened by preventable medical errors (4). These errors are preventable in about a half of cases with usual standards of care (5). Medical errors are inevitable and at the same time very common in the health system (6). Error in human work is an inseparable aspect of human existence, as it is unavoidable (5, 6).

Studies have shown that, regardless of the country's income level, the global burden associated with medical errors is substantial. For example, medical errors are the third leading cause of death in the United States, with more than 250,000 deaths annually attributed to medical errors (7). According to a systematic review the Middle Eastern countries, the range of medication errors is 11 to 90 percent (8). As one of the main safety problems, medical errors impose a significant financial burden on health systems. Given the preventable nature of most medical errors, health policy makers and health care professionals must take into account the associated financial dimension (1). Rodziewicz et al. noted that annual expenditures related to medical errors are approximately \$20 billion in the United States (9). Another study found that the average cost per error varied from €2.58 to €111.7 thousand, representing a range of over 100 thousand euros per medication mistake (10). By definition, a medical error is "the failure of a planned action to be completed as intended or the use of an incorrect plan to achieve a goal" and it is a major cause of preventable morbidity and mortality (1). A wide variety of medical errors has been reported based on occupational group, type of error, and health care setting (5). Identification of ME types and their prevalence plays an important role in prevention planning (3,5,11). Therefore, it is imperative to have an accurate picture of this issue (5). Medical error(s) (MEs) can occur in any care setting, including hospitals,

health centers, clinics and laboratories, so they can affect safety of patients. Moreover, medical errors have a negative effect on the patient (3, 5). There are different classifications of MEs such as technical errors, systematic errors (e.g. organizational and administrative process), and human errors (e.g. medication, diagnosis and treatment) (3); and medication errors account for 10-18% of MEs (5).

The most common medical errors in hospitals are prescribing the wrong medicine, wrong blood transfusion, surgery on the wrong place, overtreatment, suicide, falls, wrong identification of the patient, and wrong diagnosis (2). Every day, 7000 doses of medicine are prescribed in the world and 20% of them are done with an error (12). In other words, an error occurs in every 5 cases of drug administration (13). Kane-Gill et al. stated that (44,000-98,000) 19% errors happens every year in the medication process in hospitalized patients, which lead to 1.1% death in hospitalized patients and 4.2-0.03% death in ICU patients (14). MEs are more common in critical patients and most of them can be prevented (14, 15). These reports are just the tip of iceberg, because most of the cases of medication errors remain unreported due to various reasons such as treatment methods, lack of a single definition of medication error, different reporting methods, fear, and embarrassment, (16). In total, 106 errors occur in the medication process in every 1000 patients hospitalized in intensive care unit (ICU), (17). Errors in the medication administration process can lead to severe complications, increased hospitalization time (14,17,18), and death (18). Ibáñez-García et al. reported the rate of medication error in drug prescription equal to 39% (18). Moreover, Trakulsunti & Antony stated that medication errors cause harm to 1.3 million people in the United States annually (19). Bower et al. stated that 750 million medication errors occurred in the UK (12). Severe consequences of medical errors often occur in intensive care units, operating rooms, and emergency departments. Medical errors are linked to the age of patient, the implementation of new procedures, and the urgency and intensity of medical services (2). In May 2019, the 72nd

World Health Assembly approved the World Patient Safety Day to raise global awareness of patient safety and encourage global solidarity and action. During the assembly, it was acknowledged that patient safety was essential for countries to progress towards universal health coverage, calling for patient safety to become a global health priority (20). Iran's health system is no exception and it is very important to have an accurate picture of MEs in Iran (5). A systematic review and meta-analysis showed that the prevalence of medical errors in Iran was between 0.06 and 42% (21). Salmani et al. noted that 44% of pediatric nurses in Yazd hospitals committed medical errors once or twice during six months in 2015 (22). In a study that was conducted in one of the hospitals of West Azarbaijan province, the medication error rate was 58% (23). Khammarnia et al. (2015) noted a high rate of ME in Iranian hospitals in their systematic review. Based on the results of the random effect model, the overall prevalence of medical errors was estimated equal to 50%. The error rate in doctors and nurses was 31% and 37%, respectively. The error rate in the medication process including prescribing, recording and prescribing was 31, 27, and 35% respectively (3). Given the high prevalence of errors, Mahmoudi et al. reported that the emergency department had the highest rate of errors with 165 errors. The most important errors were in laboratory reports (276), pharmacy 158) and internal (136) wards. Nurses and pharmacy and laboratory personnel had the highest number of medical errors with 225, 177, and 151 cases respectively (6). Due to the lack of gold standards in this field, the estimated prevalence varies from one study to another. Therefore, considering the importance of ME events as a challenge in Iran's health system, a comprehensive study in this field is necessary (3,5,21) and requires more attention (5).

Considering the above, the hospital in general (1,5) and emergency departments (6), ICU (14,15), internal medicine (5) and gastroenterology (24-26) in particular have a high risk of MEs. Hospitalized patients undergo invasive and non-invasive procedures that affect their quality of lives and survival. In addition, they are at the risk

of adverse side effects of drugs, diagnosis, surgical procedures, and misdiagnosis (24, 25). Adverse events and MDs could cause complications, prolonged hospitalization (14,17,18) and even death (18). According to the results of experimental evidence, errors with serious injuries occur in 10% of hospitalized cases and half of these incidents can be identified and prevented (27). Therefore, given the importance of identifying and preventing errors, this study aims to pinpoint common errors in the gastroenterology department and put forward prevention strategies.

Materials and Methods

The study was carried out through a combined method (quantitative, qualitative) in a sequential manner from June 2021 to October 2022. The objective was identifying common errors in digestive departments and practical prevention strategy to prevent errors. In the first (quantitative) stage, researchers designed a checklist of safe measures in digestive departments and after confirming the validity and reliability, common errors in the department were identified. In the second stage (qualitative stage), appropriate practical prevention strategies were extracted by interviewing nurses and doctors working in the gastroenterology department.

Data collection

Data was collected using a researcher-made checklist. To prepare the tool, in the first stage, a review of the texts was conducted and based on the results, relevant items were identified. Literature review was done using keywords namely, patient safety, gastroenterology, endoscopy, and medical errors in PubMed, Google scholar, SID, and Magiran. Papers published between 2010 and 2021 were included in the search. In total, 85 papers were obtained and then examined by two researchers separately and simultaneously. Out of the 85 papers, 61 were selected for study after reviewing the abstracts of the articles. In the next step, the original articles were reviewed and 21 studies were found to be suitable. The articles were analyzed through a content analysis method. In the next step, formal validity (qualitative) and content validity

(quantitative and qualitative) were examined. To check qualitative formal validity, the views of nurses and doctors working in the departments were examined regarding the level of difficulty, relevance, and ambiguity and the necessary corrections were applied to the items. The tool contained three dimensions of environmental safety, patient care, and empowerment and four items (8, 13, 11, 29) were removed. The CVI and CVR of both checklists were calculated.

At this stage, 10 gastroenterologists and nursing experts were asked to rate each item regarding the necessity of the items, and then CVR was calculated using the formula $CVR = (n_E - N/2) / N/2$ (28, 29). The CVR varies between +1 and -1 and a score above zero indicates that the item is essential. The minimum acceptable score of CVR was checked using the Lawshe table (30); afterward, CVI was calculated, which was acceptable (Table 1).

Table 1: The content validity of the tools

	CVR	CVI		
		clarity	simplicity	Relevance
Safe Care	0.88	0.92	0.95	0.95

In the next step, the reliability of the tools was checked based on agreement among the observers (31). The checklist of care measures with 89 cases was completed by two supervisors (44 cases by supervisor No.1 and 45 cases by supervisor No.2) and no significant difference was observed between the tools completed by the supervisors ($p > 0.05$).

Data Collecting

The data of the quantitative phase of the study were collected in the gastroenterology departments of Ayatollah Taleghani and Imam Hossein (AS) hospitals in Tehran. According to the number of items, 3-10 samples were suggested for each item (29, 32). Five samples were considered for each item, and 95 samples were selected given the probability of 20% attrition. The data was collected from May 2021 to August 2021.

Data analysis

Analyses in the quantitative stage were conducted in IBM SPSS Statistics (V.20) (IBM Corp., Armonk, NY). The data of the qualitative stage was completed with the participation of 77 nurses between August 2021 and February 2022. In this stage, by forming a virtual group, the results of the quantitative section were provided to the participants and they were polled about the proposed prevention strategy. After collecting the opinions, the data was coded using the content analysis method in order to improve the accuracy and accuracy of the

findings (31) by two researchers simultaneously and separately. After classifying the codes, prevention strategies were identified.

Results

The mean number of hospitalized patients in the studied departments was 98.7 ± 66.28 and the mean number of nurses was 4.83 ± 26.3 . It was found that the most medical errors were without serious and the most errors in drug registration was drug card registration (42.9%), drug preparation (38.1%), and drug prescription (33.3%). The errors were most common in nurses (42%), students (33%) and medical assistants (25%). Errors with serious complications in terms of wrong diagnosis constituted 2% of the errors. In terms of patient education, the mean (SD) of errors was 6.97 (2.38); which indicates inefficient patients education, and the need to pay attention to empowering self-care in patients.

Identify Prevention Strategy

The qualitative phase was conducted with the participation of 77 nurses with an average work experience of 9.68 years. The proposed prevention strategies included the modification of department monitoring processes, appropriate training, modification of clinical processes, improvement of patient education, and development of error reporting culture. In the supervision category, it was suggested that the supervision must be done actively by trained

personnel. The prevention strategies included improvement of the drug treatment process, elimination of redundancies, use of efficient software for drug registration and administration, updating similar drugs in terms of form and name, sensitization of employees regarding error reporting, and use of efficient software for error registration and reporting. Regarding the promotion of patient education, the proposed prevention strategies were to hold training courses for employees regarding self-care and to teach methods of interaction and professional behavior. The participants stated that the lack of time to educate the patient was one of the problems of incomplete education. By using efficient media and software for educating the patient, as well as eliminating time-consuming and old processes, more time can be spent to educate patients. As for developing error reporting culture, using efficient error reporting systems is recommended.

Discussion

The study was carried out to recognize prevalent errors in the gastrointestinal unit and to outline strategies for prevention. The results indicated that the occurrence of errors has a high prevalence, which is often detected in the stage before the occurrence and are without risk. However, considering the potential for harm caused by medical errors, it is necessary to have a proper error detection and reporting program. The proposed prevention strategies included the modification of department monitoring processes, educational courses, modification of clinical processes, and enhancement of patient education and development of error reporting culture.

Khammarnia et al. (2021) reported a high prevalence of errors, which was higher in young and late-night nurses. They highlighted that, given the extent of the error involved, greater focus is required on the comprehensive treatment process. Errors can be reduced through various strategies such as clinical staff training and support for safe practices, and updating and adapting systems and technologies (3). Their results are consistent with the results of the current research and the recommended prevention strategies. Vaziri et al. (2019) stated that

nurses had the highest rate of errors, which was mostly medication errors in academic or teaching hospitals and in internal/special departments. They calculated that the overall occurrence of medical errors was equivalent to 50% and underlined the importance of enhancing nurse training, fostering a culture of patient safety and service quality, and focusing on specialized departments, particularly in teaching hospitals, as areas for further improvement (5). Education was one of the prevention strategies proposed in the present study. Our findings also showed that the errors were more common in nurses and nursing students. Considering that nurses have the largest contribution to the care of patients (11), they also play a significant role in the occurrence and prevention of errors. Therefore, their results are in line with the results of the present study.

Boostani et al. (2019) reported that 89% of patients experienced at least one ME during their hospital stay, which is lower than the rate of ME reported by other studies. The small number of trained and skilled nurses, the variety of patients' complaints, and the absence of clinical pharmacists in appointments or clinical visits are among the factors in the occurrence of errors. In their study, the majority of ME (more than 70%) occurred in the prescribing node by attending physicians, and the rest of the errors were in transcription and prescribing by nurses.

The most common types of prescription errors were inappropriate drug selection, unauthorized drugs, and not prescribing the drug despite the patient's clear symptoms. The highest ME was observed in cardiovascular drugs, followed by antibiotics and vitamins, and minerals and electrolytes (33). In terms of error factor, their study was inconsistent with the present study except for the small number of nurses and the presence of a supervisor in the department.

Mahmoudi et al. (2016) reported that emergency departments had the highest number of errors with 165 errors. Department laboratory (276), hospital pharmacy (158) and internal medicine (136) were the top error reporting units. Nurses, pharmacy, and laboratory personnel had the

highest number of medical errors with 225, 177 and 151 cases respectively (6). Their results in terms of error factor were similar to the present study, where the most errors were made and reported by nurses.

An error in the medication administration process includes any error in any step of the process including prescribing, preparing, administering and monitoring the medication (34). Salami in Jordan reported that 64.9% of errors in the medication process were in the calculation of dopamine, dobutamine, intravenous insulin, potassium, heparin, subcutaneous insulin, morphine, amiodarone, gentamicin, and chemotherapy judgements (35). Calculating the accurate dose of injectable infusion drugs is one of the most significant challenges in the medication process, and morphine, dopamine, noradrenaline, and potassium were the drugs with the highest rates of incorrect calculation. (36). Considering the result of those studies and also the results of the current research, it can be concluded that the drugs with high error rates in the calculation are the drugs that need more accuracy. In this regard, prevention strategies to improve processes, update similar drugs in terms of shape and name, and sensitize employees regarding error reporting were recommended. Other studies have also shown that doctors, nurses, and nursing students in different treatment environments do not have enough skills regarding drug calculations, drug knowledge, drug interactions, and the skills to educate patients about drugs (17, 34, 37).

Hence, strategies to prevent medication errors, such as conducting regular training sessions using simulated clinical scenarios of medication errors, training on the correct drug therapy method, emphasizing the importance of safe drug therapy, simplifying drug calculations for nurses, providing educational materials on drug calculations, and offering feedback to nurses during workshops, can reduce the risk of medication errors.

Studies have also emphasized that medication administration is one of the main areas of MEs (14, 34, 36), which are also preventable (37, 38). In this context, Giuliano (2018) stated that to improve the process of drug administration, there is a need to familiarize oneself with new drugs

and the proper use of drug administration equipment (39) and to achieve this goal, it is necessary to have efficient and continuous educational programs, including training for improving the knowledge, attitude and skill of giving medicine in nurses (17, 19, 40). Continuous training and up-to-date processes were emphasized by the findings. Therefore, the results of the above research are in line with the current research and also show the importance of having an efficient software program for drug registration and the medication process. In this regard, there is a need for software that is both practical and suitable, as it not only calculates the dose and time-interval for drug administration but also alerts users to the potential side effects of the drugs.

Medical errors are one of the most critical challenges facing medical services (1). They are a major threat to patient safety and the policymakers, health care planners, and researchers must deal with them (1, 41). Medical errors are inevitable and at the same time very common in the health system (6). Given the high rate of MEs, there is a need for a fundamental planning and systematic mechanism to evaluate and analyze the occurrence of medical errors. The errors can be an opportunity to improve health systems and prevent errors in the future (6, 40, 41). An error persists if the primary causes of the error are not addressed and the error is not identified by a designated individual (6). Therefore, based on the findings, it is emphasized that the error reporting and recording system should be designed with the capability of safe reporting and analysis of reports.

Since the most important goal of the system is to provide safe, respectful and dignified care (42) continuous monitoring and evaluation is emphasized to improve the quality of care (43); (40, 43). Some of nurses around the world do not have sufficient professional knowledge, skills, or ethics and unintentionally cause harm to the patient or other employees (42). Therefore, it is necessary to employ more educated, skilled, motivated and ethical nurses (40, 44). In this study, continuous training and monitoring of care processes were emphasized

Various systems around the world have been designed and implemented based on

the specific requirement of countries, including challenges, health care delivery structure, safety culture, and health policies. There are two types of mandatory and voluntary reporting. Once the data is entered, healthcare organizations can assess and investigate the causes and develop a process to reduce the risk of error. Because reporting both types of errors and near misses are a key to patient safety, both healthcare organizations and patients can benefit from proactive reporting. Thus, reporting creates a process by which errors and near-errors can be communicated to key stakeholders. According to internal investigations, error reporting in Iranian hospitals is ineffective and only a small number of errors are reported. Studies in Iran have shown the absence of a systematic mechanism for identifying, reporting, and disclosing errors, which is one of the fundamental weaknesses and challenges of the health system in the country (37). In conclusion, the modification of care processes and their strict monitoring, continuous education of employees, attention to the training and empowerment of patients in self-care, and use of efficient software can help reducing the occurrence of errors.

Conclusion

The result of this study indicated a high incidence of errors that were mostly harmless and detected in the pre-occurrence stage. However, due to the potential of causing damage, it is necessary to have proper error detection and reporting program. The modification of care processes and their strict monitoring, continuous education of employees, attention to the training and empowerment of patients in self-care, and use of efficient software can help reducing the occurrence of errors.

Ethical considerations

The present study is derived from the research plan approved by Shahid Beheshti University of Medical Sciences with the approval of the code of ethics IR.SBMU.MSP.REC.1400.629 and all methods were carried out in accordance with relevant guidelines and regulations in the declaration - 'Ethics approval and consent to participate' section.

Electronic consent was received from all participants in the research and the data will be kept confidential with the researcher. To observe the ethical considerations, the research goals and procedures were elucidated to the participants, they were assured of information anonymity and confidentiality, and the informed written consent was obtained from each participant. They participated in the study voluntarily and could leave the study at any stage.

Limitations and Strengths

There were no specific limitations for conducting this study; the limitation of this study was the incidence of COVID 19 disease, which affects the amount of study variables.

Conflict of interests

The authors declared no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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