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Recurrence of medical errors despite years of preventive measures: A grounded theory study

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Abstract:

BACKGROUND: Despite great efforts to improve patient safety, serious preventable medical errors continue to occur. Accurate rooting causes of error recurrence are essential for reviewing methods to prevent them. This study aimed to identify the main causes of the recurrence of medical errors despite their previous occurrence.

MATERIALS AND METHODS: This qualitative study was performed using the grounded theory method, with theoretical sampling from April to July 2021, through semi-structured interviews with 25 experts and treatment staff of hospitals under the auspices of four universities of medical sciences in Iran.

RESULTS: Four main parts were identified: 1) primary and secondary factors leading to the occurrence of errors, 2) error prevention policies, 3) causes of error repetition, and 4) contextual factors.

CONCLUSION: The attention, seriousness, and commitment of health system managers, from top to bottom, to patient safety are essential for preventing error recurrence. The institutionalization of patient safety education from universities and attention to individual, social, and cultural factors should also be given serious attention.

Keywords:

Grounded theory, medication errors, medical errors, patient safety

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Introduction

Medical errors are a serious problem and a leading cause of death in any health systems in the world. Millions of patients suffer or die each year because of unsafe care.[1]

The exact rate of the MEs prevalence is difficult to determine because the rate varies from study to study. However, studies report a range of MEs rates, 1 to 4%[2] 6 to 13%,[3] and even the high rate of 51.8.[4] Approximately 210000–400000 deaths annually are associated with medical errors among hospital patients in the USA.

More than two decades have passed since the "To Err is Human" report's publication. During this time, threats to patient safety have been identified and described. Consequently, patient safety experts have presented effective practices, strategies, structures, procedures, behavior, or actions to prevent or decrease unintended patient harm. Additionally, the science of safety has improved to describe how human factors like communication breakdowns, diagnostic errors, poor judgment, and inadequate or outdated skill and knowledge can lead to patient harm and even death.[5] Nearly all hospitals have implemented prevention strategies against different types of medical errors. However, the patients are frequently injured as a result of the care they receive.[6]

One of the most challenging unanswered questions arises why errors are repeated and which factors are associated with

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the recurrence of medical errors. By recognizing untoward events that occur, learning from them, and working toward preventing them, patient safety can be improved.[7] Patient safety researchers emphasize improving the safety of healthcare systems to reduce the probability of errors and mitigate their effects rather than individual actions.[8-10]

Precise reports on the prevalence of errors in Iran are unavailable. Based on a systematic review in 2019, the prevalence of MEs was reported as 50%.[11] In one study, the prevalence of medical errors was reported to be between 6 and 42%[12] Similar to other countries, Iran has taken actions to reduce medical errors. The first action was to use clinical governance in 2009.[13] After that, accreditation requirement focusing on patient safety measures has been in hospitals since 2012. additionally, patient safety guidelines based on WHO guidelines were communicated by the Ministry of Health to all medical universities.[14] In 2017, a set of 28 errors entitled events that should never happen was communicated to medical universities. Despite the existence of several preventable solutions, medical errors still occur and it has been years since error prevention policies were introduced; these policies are still being implemented in their original form. Therefore, it is necessary to determine the reasons for errors in repetition.[11,12,15] Previous studies only dealt with the causes of medical errors and provided solutions to prevent them, but this study, focusing on the repetition of medical errors, pays attention to why they repeat, and in this sense, it has started to innovate.

This study fills this gap and focuses on potential causes of errors that have received less attention previously and can consider the reasons to error repetition and then provide preventive solutions. To achieve the goal of the study, we used the qualitative method with the grounded theory approach because there is little knowledge about the reasons for the repetition of errors, and a description of the phenomenon was needed.

The purpose of this grounded theory study was to:

1. Explore Why medical errors repeated despite preventive measures
2. Explore What strategies are to prevent the repetition of medical errors
3. Develop a theory of repetition of medical errors

Materials and Methods

Study design and setting

This qualitative study was conducted using the grounded theory approach derived by Strauss and Corbin.[16] This approach was chosen because there is little knowledge about repetition errors, and it was necessary to describe the phenomenon and formulate a theory.[17]

Study participants and sampling

The study environment was Iran, which is located in Southwest Asia. In Iran, health service delivery and medical education are integrated under the Ministry of Health and Medical Education (MOHME). Medical universities are under the supervision of MOHME, and one of their duties is to oversee the healthcare institutes in the provinces.

Sampling was targeted based on a set of criteria with the grounded theory approach. The selection of participants was initially purposeful, and theoretical sampling was then performed. Every researcher has perspectives, biases, and assumptions that come with him in the research process.[16] We used constant comparisons to reduce bias, which is important in grounded theory. First, patient safety experts working in hospitals were interviewed purposefully to obtain a clearer picture of the current situation and their concerns about medical errors and their causes. The reason for using theoretical sampling was to select the next samples after analyzing the previously collected data to determine the depth and enrichment of the categories. Participants in the interview included 25 specialists in the field of patient safety, university professors, general practitioners, and nurses in different universities and hospitals (i.e. Tehran, Iran, Shahid Beheshti, and Hamadan universities of medical sciences, and their subordinate hospitals). The participants ranged in age from 29 to 57 years old.

Data collection tool and technique

The interview guide was prepared based on the research objectives and was sent to individuals along with their appointment times. The interviews were semi-structured with six questions. Due to the COVID-19 epidemic, most interviews were conducted using video calls by the first author (NA). Interviews typically lasted between 45 minutes and one hour. At the beginning of all interviews, a detailed explanation of the concept of the recurrence of medical errors was provided. At the beginning of each interview, we asked participants for permission to record their voices. Theoretical sampling continued until the characteristics and dimensions of the categories were determined. Interviews were recorded, and also interviewer took notes to ensure that rich details were captured. The interviews and their analysis continued until theoretical saturation was reached and the concepts were fully developed. Data collection was conducted over two months, from April to July 2021. The participants were assured of anonymity.

All interviews were recorded and then transcribed verbatim which started immediately after the first interview and continued throughout the data collection process and classifications were constantly being created and changed Transcripts were provided to the participants for validation. Thus, a set of experimental insights was

created using Corbin and Strauss constant comparison techniques and instructions for data coding.[18]

First, open coding is performed. Immediately after each interview, the interviews were conducted and compared with previous interviews. The text of all the interviews was studied individually and line by line, and its concepts and categories were extracted. Codes were extracted immediately after the first interview started and continued throughout the data collection process, and classifications were constantly being created and changed. Therefore, a set of empirical insights was developed using Corbin and Strauss constant comparison techniques and guidelines for coding the data. During axial coding, the categories were connected to subcategories, the categories extracted from each interview were compared with the categories of other interviews, and the categories were integrated. After the open and axial coding, selective coding was performed. At this stage, the categories and their dimensions were compared and integrated, and the main category was identified.

Ethical consideration

This article is taken from the doctoral dissertation of Health Services Management from Iran University of Medical Sciences, Iran, which has an ethics code number IR.IUMS.REC.1399.774 from the ethics committee of Iran University of Medical Sciences, which can be found at the university's research site at https://research.iums.ac.ir and is available in Persian with permission.

Result

In total, 25 interviews were conducted. The participants' information is shown in Table 1.

In addition to addressing the causes of the recurrence of errors that occur after corrective actions, participants also cited factors that were the primary cause of the errors and existed before any preventive policy was implemented. This led to an overview of the process of error occurrence and repetition. [Figure 1]

All themes were derived from the data. Focusing on the existence of error prevention policies, the causes of error recurrence were identified by the participants. In addition, underlying factors were identified and other identified factors were formed in their context. Each is described as follows:

A) Primary and secondary factors causing the error:

After identifying these factors, they were classified into two themes and seven sub-themes, which included

Table 1: Course of study, occupation, and demographic information of the participants

Field of study	Occupation	Age	Gender	Work experience
Master of Health Services Management	Responsible for patient safety Vice Chancellor of the University	38	Female	14
Master of Health Services Management	Patient safety expert in the University Vice Chancellor	38	Female	15
PhD in Health Services Management	University faculty member and has research experience in patient safety	35	Female	8
PhD in Nursing	Member of the University Nursing Faculty and has clinical work experience	37	Female	10
Bachelor of Nursing	Hospital patient safety expert and nurse	39	Female	16
Bachelor of Nursing	Hospital patient safety expert	48	Female	29
Bachelor of Nursing	Patient's safety and infection control expert	44	Female	18
Bachelor of Nursing	Hospital patient safety expert	41	Female	15
Master of Nursing	Hospital Patient Safety Expert and Clinical Supervisor	42	Female	17
Bachelor of Nursing	Head-Nurse and hospital patient safety expert	44	Female	25
Master of Nursing	Hospital Patient Safety Expert and nurse	46	Female	19
Medical specialty	Internal medicine specialist	32	Female	5
Doctor of medicine	General Practitioner	42	Man	13
Medical specialty	General Surgeon	57	Man	28
Medical specialty	Internal medicine specialist	31	Female	5
Medical specialty	General Surgeon	32	Man	6
Medical specialty	Ophthalmologist	45	Female	17
Bachelor of Nursing	Hospital Patient Safety Expert and Clinical Supervisor	46	Female	23
Internal resident	Internal resident in hospital	29	Female	3
Bachelor of Midwifery	Midwife	36	Female	12
Bachelor of Nursing	Neonatal Nurse	37	Female	10
Master of Health Education	Responsible for patient safety Vice Chancellor of the University	35	Female	12
Medical specialty	Anesthesiologist	45	Man	17
Bachelor of Nursing	Nurse	37	Female	2
Medical specialty	Radiologist and neurologist	40	Man	16

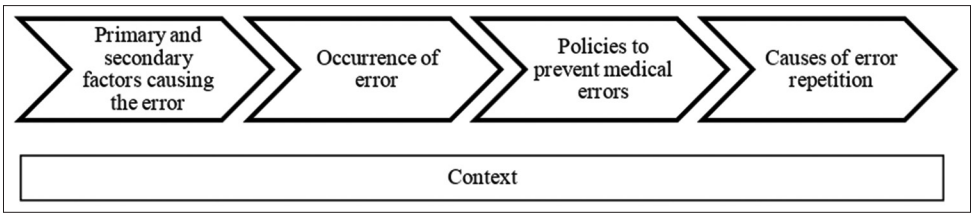

Figure 1: The process of occurrence and recurrence of medical errors

1) working conditions and environment and 2) managerial factors. [Table 2]

1. Conditions and work environment:

The conditions and environment in which treatment staffs work affect their performance. These conditions include how the workplace is organized, team communication, patient and illness-related conditions, and the extent to which the workplace is motivated, all of which have the potential for error if not implemented properly.

1-1 Improper organization: This case includes inappropriate staffing, intensive work shifts, lack of manpower, high workload, and facing various crises such as natural disasters and accidents that lead to staff fatigue which can manifest itself in different parts such as wrong medication:

"When I am on the night shift, there are two of us with 40 patients. Can I get up at 6 AM and get 40 VS (vital signs) and give 40 medicines to patients when my co-worker asleep? I have to do a lot of work in less time, and it is clear that there are conditions for error" (No. 4).

2-1 Weak team communication: In the normal conditions of teamwork, there is a friendly atmosphere between team members and they learn from each other and are not afraid to express their mistakes and those of other team members. However, in a hospital as an organization, the effectiveness of teamwork usually depends on the physician. For example, a physician with specialty and power in a hospital or a dictatorial personality may work individually and the opinions of other team members may be irrelevant to him/her:

"... This state of teamwork should be in the team they are working on. Many of the problems are that the main person, such as the surgeon, has a dictatorial state that makes them afraid to tell him even if he or she makes a mistake... or the main person may not listen at all. This state of dictatorship still exists in the field of medicine. This can cause many mistakes... The relationship between the leader of the medical team and the staff is very important... If this relationship is not established, the patient can experience serious injuries." (No. 16)

3-1 Factors related to the patient and the disease: The patient's awareness of his rights, one of which is the patient's familiarity with his treatment process, should be done understandably. The lack of patient participation in the treatment process could be a cause of this error. These cases are sometimes due to the inattention of the treatment staff to communicate properly with their patients and sometimes due to the patient's condition, such as the patient's condition and complexity of treatment, making it difficult for them to participate. This increases the likelihood of an error:

Table 2: Primary and secondary factors causing the error

Categories	Sub-categories
Conditions and work environment	Improper organization
	Weak team communication
	Factors related to the patient and the disease
	Unmotivated work environment
Managerial factors	Not recruitment of suitable people
	Lack of necessary infrastructure
	Lack of clear planning for patient safety

"…Because in our hospital, Internal patients are admitted, they are usually complicated. In a hospital that specializes in surgery, the patient stays for two or three days, and is discharged. But here the patient has been hospitalized several times and has a lot of medicine. For example; nurses have to run two order pages. The same complexity of patients causes an increase in error. We examined a patient taking 24 medications during a night shift until morning. This raises the error." (No. 5)

4.1 Unmotivated work environment: Organizations need to understand the importance of motivating employees. This is the driving force that persuades employees to perform at their best. Without motivation, reduced productivity and job leave rates rise, which takes the organization miles away from its goals. An unmotivated work environment can cause feelings of injustice, lack of motivation, and dissatisfaction in staff, and this lack of motivation can lead to a loss of patient safety and ultimately lead to errors:

"When you are in the heart of the story, lack of motivation is evident. One reason is that we do not receive as much motivation as our sacrifice. For example, in the same period of Corona, in the first days, everyone said a lot about "health defenders," but this did not continue; it was only the first days.

The same people who came to encourage the guys came only till the hospital yard. They did not see the guys working. Instead of creating a motive, all of this created resentment. They did not pay attention to what occurred next. It is clear that with these conditions, it may be insignificant to pay attention to patient safety." (No. 9)

2. Management factors

According to the participants, the lack of commitment of senior managers to the issue of patient safety in various areas such as planning, hiring, and employing medical staff, lack of safe environment, and lack of transparent planning for patient safety have a serious impact on errors.

1-2 Not Recruitment of suitable people: The correct selection of health workers in terms of physical and mental characteristics and having the necessary abilities is a necessity for employment in the health sector. Given the importance of correct and timely decision making in the health sector, it is necessary to employ people with different abilities, including systemic thinking, problem-solving ability, and the ability to work in a team:

"A person who becomes a nurse should be examined physically first. He should not have any problems in terms of height, physical and mental condition. He should be able to work in shifts, then come and become a nurse" (No. 5)

2-2 Lack of necessary infrastructure: Inappropriate choice of the hospital environment and improper physical structure can lead to error. For example, establishing a hospital in a noisy environment can disturb staff and prevent them from concentrating on work, or slippery flooring in hospital wards can increase the likelihood of a patient falling. According to an expert:

"You go to the hospital, the person complains about the noise in the hospital and it repeats but you cannot stop it. You can see that the hospital is built in a place where the alley is narrow and dark, and the hospital itself does not have a yard. There is no parking. This disturbs the comfort of the patients and staff. The environment is important." (No. 22)

3.2 Lack of clear planning for patient safety: The lack of a specific vision, clear, accurate, and purposeful strategic and operational planning at the level of the Ministry of Health so that it seriously pursues the implementation of plans, and this seriousness is clearly understood by all lower levels, has not been felt so far:

"Patient safety has no mechanism in our country. For example, in different countries, they think and say they want to reach this point after two years. They have an action plan. Their vision is clear." (No. 22)

B) Error prevention policies

After the error occurred following the primary and secondary factors, participants stated 10 preventive policies that have been considered by policymakers to prevent the recurrence of medical errors. These policies are divided into three main categories, including educational, regulatory, and reform policies. Many participants described these policies as weak. [Table 3]

1.Weakness of educational policies

Accurate and basic patient safety education is very significant during the student period and sensitizing it in a way that is institutionalized in people's minds. Consequently, the continuation of quality training in the workplace, which can lead to the transformation of learning into behavior, has a great effect on preventing a repetition of mistakes. According to participants, this did not occur.

"At university, the importance of medical errors is not institutionalized for us. A discussion of internalizing values is very important. This should be done for the student during his studies. If this is done, after we come, even if those conditions are not provided in the workplace, we will try to eliminate these to some extent. at least once a year, patient safety topics are repeated for the student at the university, such as course of internal surgery. Now, if someone graduated 25 years ago, this course of internal- surgery will remain in his mind unconsciously."(No. 10)

2. Weakness of monitoring policies

In the field of error management, monitoring the correct implementation of patient safety instructions is one of the supervisory duties of managers, but their insensitivity and lack of commitment to error management reduce the importance of errors among other personnel, and the frequent repetition of errors seems normal. In addition, close and continuous monitoring of the upstream organs will lead to a sense of the importance of the issue in the management and treatment of hospitals, but according to the participants, this has not happened:

"... This sensitivity should be increased, particularly in hospital managers. Sometimes when we talk in meetings, I see that the sensitivity of that manager is not high; he does not take it very seriously. When these are not taken seriously, one reaches the dead end. Senior executives must be committed to safety to keep things going. When they are not taken very seriously, what can I do as a patient-safety expert?... I am on the committee. The manager simply ignores these mistakes. When something is considered small, it repeats"(No. 7)

Table 3: Error prevention policies and the causes of recurrence of error followed by them

The main preventive policies	Sub-preventive policies	Causes of error repetition
Educational	Holding patient safety training courses upon staff arrival and continuous training courses	1. Non-institutionalization of patient safety education from the student period
		2. Lack of accurate training and sensitization at the beginning of the arrival of all treatment staff about the importance and seriousness of patient safety that leads to responsible performance in individuals
		3. No obligation to participate in training by all staff and in all shifts
		4. Holding quality training courses
		5. Audibility of training and non-conversion of theory into practice.
		6. Do not change the attitude and behavior of the person with the training
		7. Non-continuation of training
		8. Participating in patient safety training courses just to complete the training hours
	Sharing errors to learn from errors	Difficulty in transferring and sharing errors
	Communicating patient safety guidelines from the Ministry of Health to universities	1. Lack of explaining the importance of the issue to the Ministry of Health to universities
		2. Lack of seriousness of this issue in the Ministry of Health
		3. Lack of a clear vision for patient safety in the Ministry of Health
		4. Non-continuation of notification programs in the Ministry of Health
Monitorial	Monitoring of patient safety processes	Inadequate and inconsistent monitoring and poor management
	Designation of the technical manager of the hospital as responsible for patient safety	1. Lack of sensitivity of managers to error
		2. Lack of commitment of senior managers to the issue of patient safety
		3. Lack of culture of patient safety
	Appoint a patient safety coordinator in hospitals	Lack of adequate support from patient safety coordinators
Corrective	Perform Root Cause Analysis (RCA)	Lack of quality of root cause analyzes
	Encourage error reporting	1. Excessive emphasis on the system without reprimand and punishment
		2. Excessive emphasis on encouraging error reporting
	Appropriate feedback in case of repeated errors	1. Lack of proper and principled approach in cases of an error
		2. Lack of timely feedback to the offender
		3. Lack of clear and restrictive rules
		4. Tasteful and personal decisions
		5. Existence of considerations and compliments
		6. Uncertainty in decisions
	Establishing physical barriers to prevent error	Lack of use quality barriers such as electronic systems for registering doctor's orders, barcode identification bracelets, and electronic drugs

3. Weaknesses of corrective policies

Weak corrective policies imply a lack of proper implementation of error prevention strategies after the occurrence of errors, which were included in four categories: 1) lack of quality of root analysis, 2) excessive use of error reporting incentive systems, 3) lack of effective punishment levers in the repetition of errors, and 4) failure to use effective physical barriers to prevent errors.

3-1 Lack of quality of Root Cause Analysis: Using RCA is known as a method to identify the causes of error and prevent its recurrence by providing specific solutions. But the correct way to do this and use this method properly to prevent the repetition of the analyzed error is challenging:

"They are doing RCA now, but just to say that we had a meeting. Staff came. What did you tell your nurse? What effect did this meeting have in preventing it from happening again? Now in the hospital... If they make a mistake, they will not do anything about it. Therefore this is its future unless the system approach is correct and it is not paperwork." (No 4)

3.2 Excessive use of error reporting incentive systems: Error reporting has always been introduced as an important way to learn from errors, but it seems that the emphasis on encouraging error reporting is out of the ordinary and has become a goal. The purpose was to learn and prevent the recurrence of errors:

"We came and said that the reporting error was free of any punishment or blame. Maybe if the guys know that they will be held accountable for not following the instructions given by

the doctor, no matter what happens, they will know that they must carry it out. Most of the trouble is that personnel should be aware that there is a penalty for not reporting a mistake. We said you will be encouraged! does not fit with reason a bit. It is not seriousness and fear." (No. 8)

3-3 Failure to use timely feedback and effective punitive levers in cases of repetition of errors: If the system considers specific mechanisms in cases of occurrence and repetition of errors, the importance of error prevention in the workplace will increase daily. For example, if the mistake made by the person is something that has not happened before, and there are no preventive instructions for it, the wrongdoer can be given the necessary feedback immediately. This leads to a sense of importance in the mind and can prevent recurrence:

"Metron called me in a private meeting and warned me and his correct attitude prevented me from repeating my mistake." (No. 4)

However, in the case of repetition of errors that have clear instructions and the sharing errors have been done sufficiently, their repetition requires approaches that make people aware of the importance of the issue and clarify the consequences to others:

"There is no legal follow-up on unintended events or even minor mistakes, in fact, there are no legal and strong mechanisms to deal with the wrongdoer, and most decisions are tasteful and sometimes personal. There is no integration in decisions execution. There is determination in making and implementing decisions and more governance of relations instead of rules and regulations." (No. 2)

3-4 Failure to provide physical barriers to prevent errors

Failure to provide quality, effective, and sufficient physical barriers to error prevention by management and the formalities of existing barriers while increasing the workload of personnel due to lack of sufficient effectiveness are gradually forgotten. For example, using barcode-free identification bracelets, not implementing electronic medicine, and relying on personnel focus and accuracy:

"There must be insurmountable obstacles in all areas. Perhaps patient's safety should be automated in many areas so that people are only expected to focus on their main job, and the rest of the work can be done automatically... For example, electronic medicine, that is used in some countries. It can be very helpful"(No. 1)

C) Context factors

Cases that were general in nature and unrelated to a specific environment were also identified. These can be present in the context of all previous cases, and interfere with the proper execution of processes. These factors were divided into three sub-themes: personal characteristics, social status, and cultural beliefs:

1. Individual characteristics: Lack of interest in work, lack of responsibility, lack of self-confidence, lack of work conscience, laziness, haste, and disorder were recognized by participants as factors that cause repeat errors. In all these cases, the person considers patient safety as insignificant and looks at it as luxury and extra work, and this causes simplification and little attention to the error and causes the occurrence and repetition of the error.

"Interest is very important to me. People who choose their job with love and passion, for example, one likes to be an operating room technician or a nurse or not, one likes another field, one has become a nurse and one is doing nursing without interest. Of course, he may have made many errors. This interest is of great importance." (No. 17)

2. Social status and its effects on the personal and work life of staff, such as mental concerns, financial issues, poor quality of life, and stress while working, lead to insignificant patient safety, and according to participants, play a role in the occurrence and recurrence of errors:

"The volume of thoughts that come to a person during the day causes us to not be fully focused on the work we are doing at the moment we are busy and not to remember the lessons we have already learned on the subject. There is not enough peace of mind, somehow all their thoughts are really busy, and income and expenditure do not fit together, as if everything you do is backward... These factors have a significant effect on work. Many issues become insignificant and you constantly see that with such work experience, you can only afford the initial expenses. The next time a person compares himself with other jobs, he sees that he is very backward... The patient's safety goes to the margins; you want your shift to end quickly." (No. 1)

3. Cultural beliefs: These include beliefs that eventually become part of the employee work process, such as self-confidence and the notion that only others make mistakes, repetition of rare mistakes is out of mind, being influenced by the environment, and following a group that does not adhere to safety principles.

"When an error occurs for the first time, if the error is related to others and not of great importance to the individual, it may soon be forgotten. We think we always have more important things to do so we may want to skip the current task quickly and pass it we do not do right. Internal and external disorders were also found to be effective. We do not have sufficient order to do things that cause us to be distracted. We think that others make mistakes and we may not make mistakes." (No. 1)

Discussion

In this study, which was conducted to identify the causes of the recurrence of medical errors, four main areas were identified, all of which were around the main category, which was the weakness of health system management in preventing the recurrence of errors. [Figure 2]

Numerous studies have dealt with the importance of proper workforce alignment, the destructive effect of high workload and workforce fatigue, and the importance of teamwork, and motivation in the workplace which were consistent with our study. For example, a study by Lucyna Iwanow *et al*. reported a high level of communication skills among medical staff significantly improves the effectiveness of treatment under interdisciplinary team management, the quality of health care, including patient and staff safety, and patient and family satisfaction with health services. They emphasized that communication skills training is crucial for employment in the health profession.[19] In our study, poor team communication was introduced as one of the primary factors causing medical errors too. In another study, workload, shift work, long working hours, poor infrastructure, insufficient resources, and lack of staff were the main factors contributing to poor working conditions[20] which is consistent with our study that stated failure to provide the necessary infrastructure, such as establishing a hospital in an unsuitable environment and a nonstandard physical structure, lack of appropriate staff, and lack of clear planning for patient safety at high levels, were considered effective in the initial occurrence of the error.

To emphasize the correct training of students to institutionalize patient safety, the importance of teamwork has also been discussed. A study showed that the most important strategies in reducing intra-labor errors were: supervising educators while providing clinical services, the impact of items on end-of-course evaluation, making changes in the presentation of educational topics, moving toward active teaching methods, and the use of intelligent software.[21] Another study presented that educational workshops (an individual's self-perception of one's ability to perform competently and to achieve a task or goal effectively) may enhance self-efficacy among nurses.[22] Establishing appropriate conditions that lead to learning from one's own mistakes and others' mistakes in the form of correct sharing of errors was considered in this study. In a review study, Dahlin *et al*. identified three mechanisms through which individuals learn from failure: opportunity, motivation, and ability.[23] In addition based on Braithwaite's study, it is necessary to address concerns related to training and development to prevent unwanted negative consequences; and stakeholder participation should be considered in this field.[24] So it is necessary to identify different educational methods that can effectively lead to the institutionalization of patient safety among students. The use of educational scenarios derived from medical errors can be helpful in this field.

Therefore, the issue of patient safety should be actively included in the *Medical Students Curriculum* and emphasized throughout the study. Moreover in the workplace, this seriousness should continue in patient safety training with medical system managers.

Vrklevski *et al*. showed that RCA lacks the expected effectiveness and stated that there is weak evidence that the implementation of RCA recommendations leads to safer patient care; it often makes recommendations that replicate existing policies or previous recommendations. In addition, the solutions extracted as a result of RCA are not properly communicated to treatment staff.[25] However, Molavi-taleghani *et al*. stated that risk management techniques, combined with the commitment of managers and the renewal of organizational policies, can ensure the effectiveness of these activities.[26] In various studies, appropriate

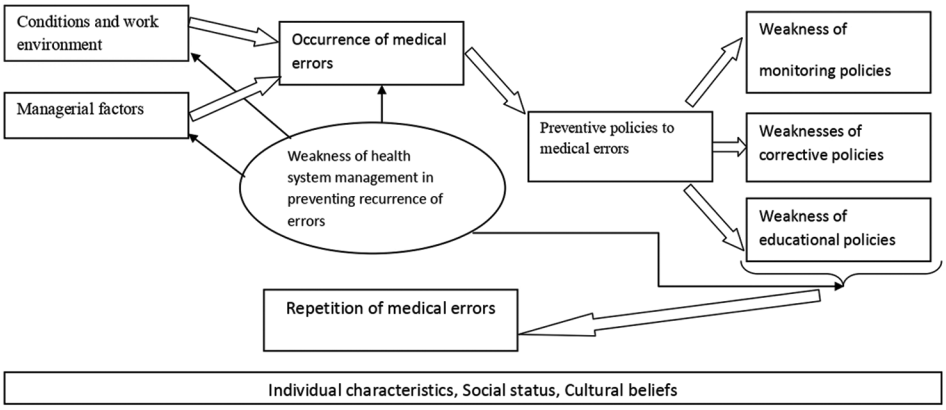

Figure 2: Theory of repetition of medical errors

and high-quality technologies such as computerized provider order entry (CPOE), bar-coding systems, and the use of smart pumps have been considered very useful in preventing errors.[27] In our study, the weaknesses of the reform policies are discussed. These include shortcomings in policies such as conducting root cause analysis (RCA), encouraging error reporting, error prevention levers, and establishing physical error barriers.

Voskanyan *et al*. also analyzed the main aspects of individual human behavior in three areas (individual, social, and situational). They showed that the observable stage of human behavior is the result of complex cognitive processes involving mental thinking, emotions, subjectivity, and motivation. They reported the emergence of medical errors in every process of human behavior.[28]

Limitations and recommendation

While the findings of this study have improved the understanding of the causes of error recurrence in the workplace, there are limitations that need to be addressed. This study was designed to gain a deeper understanding and create a basic theory about the causes of error recurrence, only in the Iranian healthcare system. This study was conducted in the conditions of economic recession and the COVID-19 pandemic in Iran, and these problems could have affected the responses of the study participants, so it is suggested that the topic of this study be re-researched in other countries and also at another time in Iran.

Conclusions

Based on our results, the primary causes of errors were not considered, and also the preventable policies were stagnant and could not be implemented properly. Therefore, they have not been sufficiently effective to prevent the recurrence of errors. This study revealed aspects that can pave the way for future studies while emphasizing the review of previous error management methods. These aspects highlight the importance of focusing on effective management by healthcare managers, effective and qualitative patient safety education in universities before entering the hospital, and attention to individual characteristics of people. This study also showed the importance of reviewing error prevention policies in health management, so that medical staff can continue their activities with more confidence and peace in times of crisis, including the COVID-19 pandemic.

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Conflicts of interest

There are no conflicts of interest.

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