



## Research Article

# Medical Errors in the Health System: An Important but Forgotten Issue

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### Abstract

Medical errors are a significant challenge in the health systems of the world, especially in developing countries. Medical errors are actions or decisions that are not compatible with the health care standards. Medical errors are divided into 4 categories: Carelessness, Negligence, Lack of Skill, and Non-Compliance with Governmental Regulations. Medication errors are one of the serious challenges facing the health system. Their correct definitions and correct categorization can help to create a proper understanding of the health system which, despite its high level of awareness, can be a serious problem to reduce the rate of medical errors and reduce mortality as a result of these medication errors.

**Keywords:** Medical errors; Health system; Developing countries

### Introduction

Today, medical error is a significant challenge in the health systems of the world, especially in developing countries, as it is the eighth cause of death in the world and the fifth in the United States. According to the published reports, medical errors are one of the main causes of increasing number of complaints in hospitals [1]. The results of a review study estimated the medical error rate 52 medical errors per 100 hospital admissions and 24 medical errors per 1000 days [2]. As it is estimated, annually 225,000 patients die at hospitals in the United States due to medical errors [3]. Medical errors mean not performing the right action in a designated plan, a global issue, costly and a factor in mortality and harm to patients. [4]. So, it is of great concern for the community [4]. The increase in medical errors has become a major problem among policy makers, providers and health professionals.

### Definition of Error

The definition of error is to disrupt the completion of a planned process in a way that the intended actions do not develop based on that plan or using a wrong plan to achieve a specific goal. Medical errors are defined as defective service, or conducting a wrong action in planning

or performance, which actually or potentially cause an unwanted outcome. In fact, the errors or mistakes made by the medical team can result in harm to the patient. These errors include diagnostic mistakes, mistakes in prescribing drugs and therapies, mistakes in surgical procedures, mistakes in using technology and equipment, mistakes in the interpretation of paraclinical tests [5]. The concept of unwanted events and medical errors of unwanted event or event adverse is told to the events that are unpredictable and somehow caused by the hospital or health system, and cause injury or damage to the patient. These events may be unpreventable or preventable, and preventable events are called medical errors. Medical error is a synonym for negligence that is not deliberate against mistake which is a deliberate error [6].

### Definition of medical error

Medical errors are actions or decisions that are not compatible with the health care standards. Health care standards are the implementation of reasonable and precise decisions that health care providers must make according to the circumstances, and we know that it is the right of patients to benefit health care according to standards [7].

### Classification of Medical Errors

Medical errors are divided into 4 categories [8,9]:

Negligence, carelessness, lack of skill and non-compliance with governmental regulations

#### Carelessness

This definition in the Islamic Penal Code is equivalent to the definition of commission in the medical errors issue, and means an action that should not be performed in terms of scientific and medical principles, but is done by negligence and due to lack of attention.

#### Definition of negligence

This definition is equivalent to omission in the medical errors issue, which means an action that should be done, but is not due to negligence.

#### Lack of skill

Includes cases in which the doctor does not have the required scientific and technical expertise to do a particular work

#### Non-compliance with governmental regulations

This means not implementing the laws and regulations of the medical system and the instructions of the Ministry of Health and the directives of the health science centers. Non-compliance with governmental regulations, in addition to criminal conviction and compensation, can lead to the disciplinary punishment of doctors and related professions [10].

### Medical Errors in Iran

In Iran, by expansion of health services, the incidence of medical errors is also increasing, although there is no precise data about this [9]. However, it seems that there has not been a comprehensive study

in this field in Iran so far. Besides, due to the lack of a comprehensive system for recording medical errors, hiddenness of many of these errors and patients' lack of knowledge about such errors, who sometimes mistook these medical errors with the natural side effects of medication or treatment and diagnosis, presentation of accurate statistics and scientific documentation is not possible. However, because of various social and economic factors, the rate of medical error in Iran is not less than its global standards and its scientific resources, and this is due to the lack of systematic reporting of errors in Iran [11]. On the other hand, its importance and benefits are clear in the countries having its experience.

But according to the existing statistics, medication errors are the most common type of medical errors in the country. Medication errors by the doctor while prescribing in many cases cause serious and dangerous problems for patients. According to research findings, the most common medical errors in hospital are by nurses when prescribing for patients. Annually, thousand complaints were presented to the medical jurisprudence. In the meantime, five complaints to the medical system were filed and these errors were identified due to a mistake by the physician in 12 cases of serious errors. Only carrying out technical measures and failing to carry out essential steps led to harm the patients' life or cause their disability [12,13]. According to available evidence, our country is far behind the global standards in terms of recording and tracking medical errors, while according to some informal, but documented estimates, every week, a female becomes a victim of malpractices common in plastic surgeries. It is in the absence of such an attitude towards medical errors which leads to plastic surgeries having the most medical error cases in Iran. [14].

### Analysis of the Root Causes of Medical Errors

Analysis of the root causes of medical errors is a process in which the main factors that lead to an alarm or an accidental occurrence (including death, drug reaction, etc.) are identified. Instead of addressing people's performance, this analysis focuses primarily on systems and their processes. From some of the specific causes in the clinical processes that led to errors, to the common causes of advanced organizational processes, potential corrections in these processes and systems that can be used to reduce the likelihood of such errors in the future are identified. The analysis of the root causes of the error is a technique that allows us to find the main or primary causes of medical errors, by eliminating and correcting them, which reduces the likelihood of occurrence of an error. With the help of this technic, you can identify the factors that put the patient at risk. These factors can be classified into three groups of organizational factors, technical factors and human factors [15].

### Organizational factors

In different parts of an organization, there are several factors that can be attributed to root causes of the error. These problems can be found in each of the organization's components, such as standards, executive practices, organizational decisions and priorities, organizational culture, and the way knowledge is transferred to employees [16].

### Technical factors

The physical components of a system, such as equipment and facilities used in the system, software used, materials needed, and even labels on the devices, can be considered as technical factors [16].

### Human factors

Researchers consider identifying the interactions between humans with their tools and equipment and the environment in which they work necessary in order to study the causes of human error. Cognitive psychologists presented cognitive theory after many years of studying of how and why humans do mistakes. In this theory, for the mental functioning of man, two main aspects are considered. Automatic aspect and Problem Solving aspect [16].

Management of medical errors also can be studied, analyzed and intervened from two aspects. First, from the perspective of the process which in its view, error recognition, root analysis and design and implementation of interventions are considered, this aspect is more likely to use flame extinction model. The second approach has a preventive perspective and identifies the system's analysis of the system and all the bottlenecks, and proceeds to the design of preventive systems. This system typically uses a virtual file evaluation model that activates quality assurance and alarm systems by designing service processes, identifying risk and error, and analyzing the possible type of error.

### Types of Errors

#### QUIC

This categorization varies from country to country, and there are totally different classifications, but the purpose of the classification is to obtain complete explanation and identification of the error. Therefore, based on the classification of the Quality Interagency Coordination Task Force(QUIC) 5 designs exists. [17]. Based on the type of health care provided (medicine, surgery, imaging, etc.). Based on severity of injury (mild, serious, fatal, etc.). Based on legal definitions (fault and carelessness, wrong treatment, etc.). Based on the location of the error (hospital, emergency, ICU, etc.). Based on the persons involved (physician, nurse, pharmacist, patient, etc.)

### Errors are divided into two active and hidden categories

**Active error:** Active error is the result of the confrontation between man and the health system. In fact, this kind of error occurs at the frontline of the service delivery to patients, and in this situation, the error is sought after the interaction of the staff with the system, which, wherever these interactions are not well-defined, it manifests as human errors. These errors are commonly referred to as human error.

**Hidden error:** Those errors are late and delayed consequences of failures in technical design, planning, or organizational decision making and organizational culture.

Errors based on the provision of services in the health system [18]

**Diagnostic error:** Error in the implementation of an action, procedure or clinical test-Error in the treatment- error in the dose or method of administration of the drug-an avoidable delay in the treatment of the patient or in response to an abnormal test-Provide inadequate care (without indication)

**Prevention errors:** (Defective presentation of prophylaxis-insufficient monitoring and inadequate follow-up in treatment)

**Other (miscommunications- equipment defect-other deficiencies in the system):** Another approach to the classification of medical errors is based on a system that has a reporting role in the system. The

application of this division method is most in the way of operating error reporting systems. Based on this, the classification of medical errors is as follows:

**Major errors:** Major errors are an error that results in death, injury, or disruptions in patient's function. This is one of the errors that its report in error reporting system format is mandatory.

### Uncomplicated events

It is events that could be potentially harmful but have not caused any real damage. This can happen accidentally due to the physiological compensation of the patient's body or the accidental elimination of the error. This kind of error is from the group in which the report is not mandatory, but this type of error is a good opportunity to identify and fix the system imperfections.

**Near-error cases (mistakes):** There are cases where the error was timely identified and then corrected. This diagnosis and then correction of the fault may be coincidental or associated with the previous program; however, no harm or injury is threatening the patient, and even the potential for harm to the patient has also been eliminated.

### Errors in terms of the basic cause

**Human error:** If the activity or decision of the person causes an accident or affects the health of the patient directly and immediately [19].

**Knowledge-based error:** Occurrence of mistakes in new situations in which persons have no previous history of training or any role in it, due to lack of sufficient experience, or a person has a malpractice which leads to error [20]

**Rule-based errors:** If individuals in the face of the same problem, run similar solutions to the previous error

Applying the rules and wrong instructions [20]

**Skill-based errors:** Unorthodox deviations in the implementation of a perfect program occur when the personnel think that the original protocol is not responsive in this situation and therefore uses their own skill in the process [20].

Other Methods of classification of errors including [10]:

Error resulting from malpractice of a command (Commission Error). (Administration of penicillin for patient with history of allergies). Error resulting from failure to perform an instruction or a correct measure (Omission Error). Failure to prescribe a suitable antibiotic for a patient. Inadequate prescription of heparin (Venous Thromboembolism prophylaxis). After hip replacement surgery, the diagnosis of omission errors is more complicated than commission errors, but causes more problems and involves more errors.

### Types of Medication Errors

#### Misdiagnosis

The first step to make an error by the doctor is to misdiagnose a disease or prescribe wrong medication. Among the reports submitted to the Iranian ADR center, diclofenac injections are observed in epigastric pain or in children younger than 21 years old, which is classified as an error in the prescription [21].

### Prescription of inappropriate doses of the medication

Receiving too much or less than the prescribed amount of medicine. A 52-year-old woman visited the pharmacy for receiving aspirin and received her medication in a bag of calcium ad, and on the other hand she took her daily aspirin [21].

#### Inappropriate Times and Number of Consumption

This mistake happens when

A: The medication is provided to the patient within 60 mins of the administration of the medication but not consumed.

B: In terms of time, medication interactions with the patient's meals are not met [22].

#### Prescribing Inappropriate Medication Form

This mistake occurs when the correct method is applied but the form of the medication is mistakenly delivered to the patient. The pharmacy personnel delivered pantoprazole instead of pantoprazole vial [22].

### The wrong order to prepare the medication

For example, it's possible to dilute the medications incorrectly, disregard sterilization, use suspensions without shaking them, fail to protect the medication from light, chemical and physical incompatibilities, and to clean the vials caps with alcohol before the insertion of the needle. Among the ADR reports, there are cases of dilution of ceftriaxone with a ringer serum that leads to medication deposition [14].

### Error in monitoring medication-treatment

All errors associated with the monitoring of a medication during or after taking medication by the medical staff; for example, the lack of measurement of a serum concentration of a medication or the inability to evaluate the effect of medication on creatinine, or the function of liver enzymes. Some medications, such as cimetidine, can lower tubular secretion and increase serum creatinine levels despite the normal renal function [14].

### Causes of Medical Errors

The causes are very complex and still not fully understood, but some of them include

#### Communication errors (lack of linguistic communication, bad handwriting, similar names)

- Increased specialized care and undisciplined fragmentation: The greater the number of people involved in health care and the division of services into smaller chunks, the greater the probability of error, and there is a very high probability that a part of the service goes unperformed.
- Errors due to high activity and increased work shifts and burnout
- Errors due to manufactured products, such as (wrong signs on blood products)
- Equipment failures e.g. valve failure and pump valve (Increased medication intake time) [23].

### **Diagnostic errors**

Cause wrong medication and improper treatment. Misinterpretation of the graphs leads to wrong surgery in the wrong position.

### **Facilities and buildings with poor designs**

Traversing routes that have turn with sharp angles or high steep which cause falls and collisions between people and patients on wheelchairs and increase the number of surgeries.

### **Performance of inexperienced doctors and nurses**

The probability of an error in the performance of experienced doctors and nurses in general is low, and novice and clinical students are more prone to medical and pharmaceutical errors.

### **New protocols**

The lack of skills in medical protocols could be a factor in medical errors. Regarding this in-service training and retraining courses can be helpful.

### **Aging**

Certainly, with age, the level of precision and ability of a person to provide sensitive medical and nursing services will be diminished.

Complex health care (sophisticated technology, strong and extensive medications, intensive care and long-term residence in the hospital)

### **Special and urgent medical care**

In cases where the need for special and urgent services is necessary, factors such as limited time for performing the service, emergency stress can increase the incidence of medical and nursing errors.

### **Solutions to Reduce and Prevent Incidents of Medical Errors**

In order to reduce medical errors, a series of articles and studies have introduced two important technologies for reducing and preventing medical errors, especially medication mistakes.

### **Computerized records of doctors and health service providers recommendations (COPE) (Computerized physician/provider order entry)**

A method that physicians write their own commands online, and in fact is a computer-centric system with a variety of options that, by commonly used machining, distributes and divides the medical prescribing process and creates legible, standard, and complete instructions. This method has had the greatest impact on reducing medication errors, up to reducing 83% of errors. This method improves the commanding *via* ensuring legible, clear and complete orders and has ability of doctors' cooperation at the time of commanding with suggestions of doses and proper sequence medicines, indicating the laboratorial data and the selection and differentiation of instruction for allergies, medications and interventions laboratory.

### **Clinical decision support system (CDSS)**

Nearly half of the medical errors are related to incomplete information about patients and medications. This system provides support for clinical decision, for patients with doctors and patient information. The information is cleverly selected and is being displayed at appropriate times, so that it integrates with the execution of a patient's computer file and a plethora of accurate and complete data. Increasing of the performance quality of health care institutions by the computerized clinical decision systems, are as the result of common information technology utility in healthcare realm, which if are properly used, major benefits such as better planning, reducing costs, reducing medical errors, and increasing the quality of services can be resulted for organizations. The main advantages of the clinical decision support system are.

About 55% of severe medication errors and 83% of total medication errors are reduced using CDSS

### **Bar code medication administration (BCMA)**

Barcode technology connects computers and the network. The mechanism of work is that after the admission, each patient gets a barcode wristband, new medication orders are introduced electronically, the nurses and the pharmacy immediately see the information. The pharmacist checks all orders for allergies, medication interventions and dosing errors, and etc. then prepares and prescribes the dosage of prescription medications and sends the barcode parcels to the nurse. The medication card of each patient is such that the prescribed amount of medication is stored in it and is accessible. A bar code medication for confirming the prescribed dose and type of medication, and also the patient's wristband for medication management are scanned. Reducing medication errors by ensuring all five steps of the medication management process: the actual patient, the medication and the correct prescribed dose, the route and the correct time in this system is possible.

### **Electronic health record (HER)**

Electronic health records are available at the same location for different people at the same time and information retrieval is possible to be done instantaneously. In this electronic case, information about the entire lifetime of a person is registered and approved by health care providers, is distributed on various sites and transferred to the files safely in the files and thus all relevant health life information included in them such as examinations, interpretations, plans, actions, illness and injuries, assessments, vaccination records, behavioral, environmental, demographic, and management data as well as legal data such as consent letters.

Computerized medical commands allow doctors to perform diagnostic tests, medications and other processes using computer systems. Some hospitals have implemented a computerized medical system to reduce the rate of medical errors. Among the existing technologies, the computerized system for recording medical orders is a special place to reduce medical errors. Published studies indicated that computerized filing of health service providers' orders reduces medication errors by up to 81%.

### **Conclusion**

Medication errors are one of the serious challenges facing the health system. Their correct definitions and correct categorization can help to

create a proper understanding of the health system which, despite its high level of awareness, can be a serious problem to reduce the rate of medical errors and reduces mortality as a result of these medication errors.

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