

## THE ANALYSIS OF PRESCRIPTIONS AND DISTRIBUTION OF MEDICINES IN THE PREVENTION OF MEDICATION ERRORS IN COMMUNITY PHARMACIES

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Manuscript received: February 2022

### Abstract

Medication error is one of the public health problems, as many of them can affect patient's health and lead to increased treatment costs. These errors compromise patient's level of trust in the healthcare system. The pharmacist must be involved in the process of improving the patient's quality of life by cooperating with the patient and other health professionals. Thus, we aimed to identify the frequency and type of prescription errors in the national health system and their description based on the evidence accumulated from the collected prescriptions. The research methods were determined by the information collected based on the analysed prescriptions, direct interviews, brainstorming method and voluntary reports. The research batch included 754 prescriptions with 1104 drugs, with an average of  $1.46 \pm 0.66$  drugs *per* prescription. In the 754 prescriptions analysed, 1872 errors were detected, the most frequent being: errors in the name of medicines (22.54% CI<sub>95</sub>: 19.5575 - 25.5225), errors in the pharmaceutical form (16.97% CI<sub>95</sub>: 14.2907 - 19.6493), lack of information about the patient (10.74% CI<sub>95</sub>: 8.5300 - 12.9500), lack of information about the doctor (90.18% CI<sub>95</sub>: 87.8780 - 92.4820) and errors in the period of validity of the prescription (87.93% CI<sub>95</sub>: 85.6046 - 90.2554). The identification and analysis of the errors will allow the development of the strategies of improvement for the health care systems safety. Taking into account that it is not possible to prevent all the errors, and in order to act before they reach the patient, it is necessary to implement controls in the working procedures that allow the detection of errors.

### Rezumat

Erorile de medicație sunt una din problemele sănătății publice, deoarece multe din ele pot afecta sănătatea pacienților și duc la costuri sporite ale tratamentului. Aceste erori compromit nivelul de încredere al pacienților în sistemul de sănătate. Farmacistul trebuie să se implice în procesul de îmbunătățire a calității vieții pacientului prin cooperarea cu acesta și cu ceilalți profesioniști din domeniul sănătății. Astfel ne-am propus identificarea frecvenței și tipul erorilor de prescriere în sistemul național de sănătate și descrierea lor în baza dovezilor acumulate din rețetele colectate. Metodele de cercetare au fost determinate de informațiile colectate pe baza rețetelor analizate, interviuri directe, metoda *brainstorming*-ului și rapoarte voluntare. Au fost luate în studiu 754 de rețete având prescrise 1104 medicamente, cu o medie de  $1.46 \pm 0.66$  medicamente *per* rețetă. În cele 754 de rețete analizate, au fost depistate 1872 erori, cele mai frecvente fiind: erori în denumirea medicamentelor (22,54% CI<sub>95</sub>: 19,5575 - 25,5225), erori în forma farmaceutică (16,97% CI<sub>95</sub>: 14,2907 - 19,6493), lipsa informațiilor despre pacient (10,74% CI<sub>95</sub>: 8,5300 - 12,9500), lipsa informațiilor despre medic (90,18% CI<sub>95</sub>: 87,8780 - 92,4820) și neindicarea termenului de valabilitate al rețetei (87,93% CI<sub>95</sub>: 85,6046 - 90,2554). Identificarea și analiza erorilor va permite realizarea unor strategii de îmbunătățire a siguranței sistemelor de îngrijire a sănătății. Ținând cont că nu este posibilă prevenirea tuturor erorilor și pentru a acționa înainte ca acestea să ajungă la pacient, este necesară implementarea controalelor în procedurile de lucru care să permită detectarea acestora.

**Keywords:** medication errors, prevention, pharmacist, prescriptions

### Introduction

The error, by definition, is "the unintended use of a wrong plan to achieve the goal, or failure to implement the predestined plan" [2]. The existence of the errors denotes the decrease in the effectiveness of the therapeutic process, which includes the treatment or prevention of diseases, as well as the investigations

necessary for diagnosis. At the same time, these errors can be caused by the manufacture or preparation of drugs, their prescription, dispensing, as well as their administration [19]. It is important to point out who is responsible for the error: pharmacist, doctor or patient when taking the treatment. The analysis performed on the detection of medication errors showed that 30% of errors occur at the time of prescribing, 12%

at dispensing, 11% at recommendation and 38% at medication administration [6].

Prescribing is the most important tool used by doctors to treat patients, relieve symptoms and prevent diseases [15]. Each prescription constitutes an experiment, the result of which is never certain [5, 7]. A major problem with prescriptions is prescribing errors that can affect the patient's health if they have not been noticed in time by the pharmacist.

Studies conducted in some European countries and the USA on the accuracy of medical prescribing have shown the following: more than 1/3 of the prescriptions were illogical or were in a situation of endangering the patient's life; in the case of prescribing four or more associated medicines, the number of prescriptions with errors amounted to 1/2; the incidence of errors in the medical prescriptions of general practitioners (36%) is higher than in specialist doctors (25%); the best performances were found in doctors with professional experience of over 15 years [12].

A recent study from 2019 aimed to measure the frequency and types of errors recorded in the Danish community pharmacies. The results of the study demonstrated that prescribing errors were the most common type of error. The error rate was estimated at 23 to 10 thousand prescriptions. Moreover, the results of the study showed that a small number of errors actually reached the patient, the error rate was 1 to 10 thousand prescriptions, but many of these errors were potentially clinically important, and three of them led to hospitalization [16].

Other studies conducted in Italy in 2017 revealed that, out of the 412 prescriptions included in the study, the following prescribing errors had a frequency of over 10%: failure to adapt posology in renal or hepatic insufficiency (19.3%); allergy to drugs of the respective chemical class (11.2%); errors of the name, dose or pharmaceutical form (14.6%); error in calculating

the dose (10.3%); error of the administration interval (11.2%) [9].

Incorrect prescriptions are a common cause of medication errors, they are the most easily avoidable but also the most likely to cause injuries. In a London hospital, of the total number of prescribing errors, 57% were blunders or lapses, 39% were errors caused by unconscious deviations from the rules and only 4% were conscious deviations from the rules [10].

In the Republic of Moldova there are clear rules for prescribing medicines, stipulated in the Order of the Ministry of Health No. 960 of 01.10.2012 on how to prescribe and dispense medicines. However, there are medication and prescription errors, thus considerably increasing the role of the pharmacist in the evaluation and monitoring of the patient's medication. An increased attention in the analysis of prescriptions and the correction of errors detected by the pharmacist, offers the possibility of collaboration and establishment of professional and collegial relations between the doctor and the pharmacist, in order to ensure the correct and rational use of medicines by patients. Also, the role of the pharmacist is essential through the consultations offered by him when dispensing the medicine, given that, in 23% of the cases, the doctor's writing on the prescription is unreadable, the pharmacist being responsible for providing the necessary information on the prescribed medicines [1, 21].

Medication errors and their negative consequences are today a serious problem in public health, with important repercussions not only from a human and economic point of view [8], but also because they generate distrust among patients. The ability to understand and accept errors is necessary to be able to create a reliable health system.

Hansen *et al.* mention the following classifications of prescribing errors, presented in Table I.

**Table I**

Classification of prescribing errors, according to Hansen *et al.*

<b>1. Depending on the potential risk:</b>		
Type A	<b>high risk to the patient</b>	The prescription could seriously affect the patient if it were released [13].
Type B	<b>major effort</b>	The pharmacist should contact the prescribing doctor before dispensing the prescribed medicines [13].
Type C	<b>minor effort</b>	The pharmacist must make a decision before dispensing the medicine, without having to contact the prescribing doctor [13].
Type D	<b>usual</b>	The prescription is not finalized according to the regulations, without raising doubts about the recommended drug treatment (spelling errors) [13].
<b>2. Based on the criteria of general psychology:</b>		
Action planning errors	Lack of knowledge (dispensing the medication without determining whether the patient is allergic to this medication or not) [17, 23];	
Principle errors:	Incorrect application of a correct rule (e.g. administration of the medicine in a different way than intended) [17, 23];	
	Application of a wrong rule or non-application of a right rule (e.g. using the wrong dose of medicine) [17, 23].	
Individual errors:	Inattention or omission [20];	
	Memory problems (e.g. the release of a medicine to a patient who is known to be allergic to that substance) [20];	
	Technical errors [20].	

Dean *et al.* mention the following categories of triggering factors for prescribing errors.

**Table II**  
Causal factors of prescribing errors [11]

Factors associated with medical staff	Factors associated with the work environment	Factors associated with medicines
<ul style="list-style-type: none"> <li>• Lack of training in the application of therapies</li> <li>• Insufficient knowledge and experience in matter of medicines</li> <li>• Insufficient knowledge of the patient</li> <li>• Improper perception of risk</li> <li>• Overworked or tired medical staff</li> <li>• Problems related to the physical and emotional health of medical staff</li> <li>• Poor communication between medical staff and patients</li> </ul>	<ul style="list-style-type: none"> <li>• Workload and time pressure</li> <li>• Distractions and interruptions during the medical act</li> <li>• Lack of standardized protocols and procedures</li> <li>• Insufficient resources</li> <li>• Problems with the physical work environment (e.g. lighting, temperature and ventilation)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar drug names</li> <li>• Labelling and similar packaging</li> <li>• Prescription system routine</li> </ul>

The aim of the present study was the identification of the frequency and the type of prescribing errors in the national health system and the description of them based on the evidence accumulated from the prescriptions collected.

### Materials and Methods

The research methods are determined by the specifics of the research and include the information collected based on the analysed prescriptions, direct interviews, the Brainstorming method, in which pharmacists with more than 10 years of experience were included, and voluntary reports from prescribers and pharmacists. The data were processed in the SPSS Statistical Program 22. The research protocol was approved at the Research Ethics Committee of “Nicolae Testemițanu” State University of Medicine and Pharmacy, Chișinău, Republic of Moldova. The research group included 754 prescriptions collected from 22 community pharmacies in Chișinău, Republic of Moldova. Prescription error parameters were prepared by studying the WHO Good Prescription Guide for Medicines [4] and national regulations on how to prescribe and dispense medicines.

### Results and Discussion

The analysis of prescribing errors was performed based on 754 prescriptions collected from 22 community pharmacies in Chișinău, Republic of Moldova. A total of 1104 medicines were present in prescriptions, which means an average of 1.46 medicines *per* prescription. The average number of prescribed drugs on a prescription (1.46) correlates with the WHO value of the prescription indicator, which is 1.6 - 1.8.

According to the regulations in force (Annex 1 to the order of the Ministry of Health of the Republic of Moldova no. 960 of 01.10.2012), “*Medicines are prescribed exclusively in the form of an International Non-proprietary Name (INN) .... on prescription forms, approved by the Ministry of Health, with the stamp of the medical institution, filling all the compartments*

*of the prescription and confirming the prescription by applying the signature and personal stamp of a doctor”* [18].

The following compartments were analysed in the collected prescriptions.

#### *The form, the prescription header*

In 29 (3.85%) prescriptions, the header was missing, and one prescription was written on an inappropriate form.

#### *Information about the doctor*

In 64 (8.49%) prescriptions, the doctor's name was missing, and in 9 (1.19%) prescriptions only the initials were indicated. In 680 (90.19%) prescriptions, the doctor's phone number missing. Prescriber details are crucial when prescribing psychotropic, hormonal and antibiotic medicines. These medicines can only be obtained with a prescription. Therefore, the details about the prescribing physician should be sought. The lack of information about the prescriber makes it difficult for pharmacists to communicate with the doctor in case of confusion about the prescribed medicines.

#### *Date of prescription*

In 7 (0.93%) prescriptions, the prescription date was missing, respectively it was impossible to determine the validity term of the prescription.

#### *Information about the patient*

In 28 (3.71%) prescriptions, the patient's name was missing, and, in 81 (10.74%) prescriptions, the patient's age was omitted. The details of the patient's age may help the pharmacist to identify and confirm the dose and dosage form of the medicinal product to be dispensed when the information in the prescription is unclear and communication with the doctor is not possible.

#### *Pharmaceutical form*

In 126 (16.71%) prescriptions, the pharmaceutical form was omitted, in 1 (0.13%) prescription the form was illegibly prescribed, and 1 prescription contained the wrong pharmaceutical form.

#### *The name of the medicine*

In 158 (20.95%) prescriptions. the drug was prescribed under the brand name although it contained less than 3

ingredients, of which 1 name was illegally prescribed, and one name lacked the dose. In another 3 (0.40%) prescriptions, the dose was incorrectly indicated, 5 (0.66%) prescriptions contained illegible names, 1 (0.13%) prescription contained the wrong name of the medicine, in 2 (0.26%) prescriptions, the dose of the drug was missing and 1 (0.13%) prescription contained 2 prescribed substances: antibiotic + psychotropic. The Ministry of Health has established that “*Medicines are prescribed exclusively in the form of an International Non-proprietary Name (INN)...exceptions are combined medicines (containing three or more active substances) which are prescribed in brand names*”; “*Prescriptions are written legibly, in ink or pen, without corrections.*”; “*Only a medicinal product containing active substances that are part of Table III, list 1,2,3 may be prescribed and dispensed on a prescription form number 1 (Decision of the Government of the Republic of Moldova 1088 on the approval of tables and lists of narcotic substances, psychotropic substances and their precursors, subject to control)*” [18].

*Route of administration*

In 39 (5.17%) prescriptions, the route of administration of the drug was omitted, in 17 (2.25%) prescriptions, the number of psychotropic tablets exceeded the duration of treatment by 30 days, in 5 (0.66%) prescriptions the route of administration was indicated incompletely and in 5 (0.66%) prescriptions – illegible.

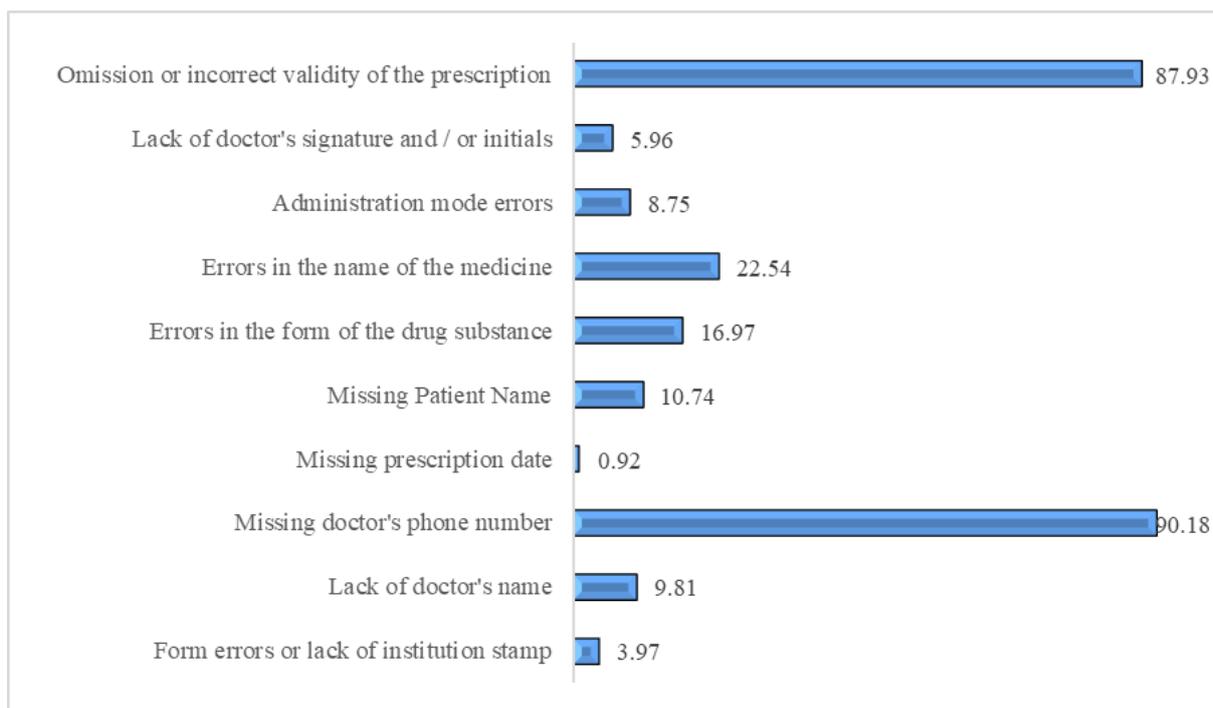
According to Order 960 of Ministry of Health of the Republic of Moldova from 01.10.2012 on how to prescribe and dispense medicines: “*The route of administration is indicated in Romanian or in the language understood by the patient, in detail and concretely (general specifications “Known”, “According to the schemes”, etc. are not allowed)*” [18].

*Signature and stamp of the doctor*

In 43 (5.70%) prescriptions, the doctor's signature and/or initials were missing, and in two (0.26%) prescriptions the doctor's stamp did not match the doctor's name indicated in the prescription.

*Validity of the prescription*

The results of the analysis of the identified prescribing errors are presented in Figure 1.



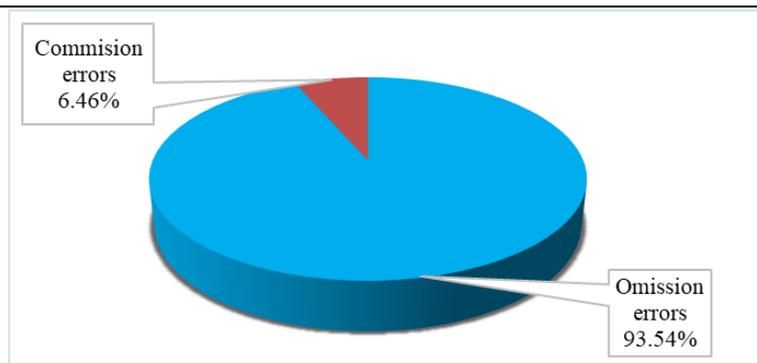
**Figure 1.**

Viscosity curves and the statistical mean of differences expressed by the regression lines

In 11 (1.46%) prescriptions, it was indicated incorrectly, and, in 652 (86.47%) prescriptions, it was omitted. From the data obtained we noticed that no prescription was identified with all the compartments filled in correctly.

Prescription errors were classified according to the production mechanism, into two types, omission errors and commission errors. The omission errors included prescriptions that lack essential information (including

patient's name, age, physician's name, signature, stamp, route of administration, dose, frequency, dosage form and quantity), while in the category of commission errors, the incorrect information written in the prescription, was included (e.g. incorrect drug name, wrong dose or wrong dosage). Thus, 1751 (93.54%) omission errors and 121 (6.46%) commission errors were detected (Figure 2).



**Figure 2.**

Structure of detected errors according to the production mechanism (%)

Although commission errors were lower than omission errors, they can lead to more serious consequences for the patient than omission errors.

Following the application of the Brainstorming method, in which pharmacists with more than 10 years of experience were included, 4 cases of prescribing errors that reached patients and caused minor (2) and medium (2) damage were highlighted: - Polygynax® N12 vaginal capsules have been released instead of Polijen® N12 vitamins due to illegible handwriting in the prescription; - when writing a prescription for the dose, the comma was very faintly visible – “Licopid 1.0 mg”. Licopid® is available in two doses: “Licopid 1.0 mg” and “Licopid 10 mg”, so the dose was misinterpreted as “10 mg” and the patient received a tenth dose; - two overdoses were recorded due to the fact that an “l” was the last letter of the name of the drug and was confused with the number “1”. In the first case a prescription for “Fluconazol® 50 mg” was interpreted as “Fluconazol® 150 mg” and in the second case “Captopril® 25 mg” was issued as “Captopril® 12.5 mg”.

The causes of the prescription errors were detected by communicating with doctors and pharmacists. Among the most common causes, it can be acknowledged: incorrect communication between doctor and patients, employees of the pharmacy without pharmaceutical studies or with incomplete studies (students); lack of information on current pharmacological trends, protocols, dosages, prescription formulations and ignorance of new drugs, narcotics, or high-alert drugs. In addition, the causes of prescribing errors include the *human factor* which may be influenced by excessive workload, fatigue, lack of experience and lack of training; *factors at work*, such as poor lighting, noise or interruptions; *pharmaceutical factors* such as polypharmacy, confusing drug nomenclature, increased number or quantity of drugs *per patient*, and increased frequency and complexity of calculations required to prescribe drugs.

#### *Prevention of medication errors*

At European level, one of the basic functions of a pharmacist, as an expert in medicine, is to help prevent avoidable risks. In the Council of Europe, resolution

on the role of the pharmacist in health insurance, which establish the formation of an epidemiological network on medication errors, the pharmacist must be involved in these issues together with other health professionals playing a key role in preventing and reducing iatrogenic risks [3].

Errors can be eliminated when they are documented, reported and evaluated as part of a continuous quality improvement cycle. Barriers to learning from prescription errors include the non-detection of many of these errors, lack of feedback to the prescriber when errors are detected by other healthcare professionals, and a culture that does not encourage reflection on errors, along with why they have occurred and how they can be prevented. Changes are needed in the system and in the organizational culture to provide an environment, in which lessons can be learned from mistakes and put into practice. Given that, it is not possible to prevent all errors and to act before they reach the patient, it is necessary to implement controls in working procedures that allow the detection and interception of errors.

A practical example of applying this measure is the implementation of “double check” systems in vulnerable points to identify errors, because it is unlikely that two people will make a mistake in controlling the same process. At the patient’s level, correct and empathetic communication from the prescriber will make the patient understand the prescription, which is an important and useful factor in reducing prescribing errors.

#### *Methods of minimizing prescription errors*

##### *Implementing electronic prescriptions*

Installing them can overcome many of the problems of the prescribing process and will bring benefits, including reducing prescription errors, increasing the readability of the prescription, improving the results of drug therapy, reducing documents, electronic access to updated information from the Pharmacopoeia, Protocols, Nomenclature and patient’s medication history.

Although e-prescribing has the potential to streamline the work process and increase the efficiency of the

system, there are some challenges and limitations that can prevent the widespread adoption of e-prescribing practices, such as:

#### *Financial cost and return on investment*

The costs associated with the acquisition, implementation, support and maintenance of such a system may exceed the means of those concerned and are noted to be one of the biggest barriers to implementation.

#### *Management of change*

It may take time to understand how the workflow around prescription management changes with the introduction of an electronic system. The change will also require pharmacists to increase their awareness of the new types of errors associated with e-prescribing, in order to better target their activities to reduce risk.

#### *Integrity of data entry*

Accidental data entry errors may occur, such as selecting the wrong patient or clicking on the wrong choice in a dosing menu [14, 22].

#### *Security and privacy*

Confidentiality of patient information stored in electronic format can lead to new errors, such as accidental disclosure of protected health information on the Internet. Another security issue that needs to be addressed is the verification of electronic signatures, in ensuring the medical integrity of prescriptions received by pharmacists.

#### *System downtime*

Periods of system malfunction may occur, either due to network problems, hardware failure, or power loss.

#### *Workplace organization*

Organization of the workspace, work environment, and workflow has been shown to significantly reduce medication errors. Proper lighting, adequate space, temperature and comfortable humidity can facilitate a smooth flow from one load to another, thus reducing the chances of making mistakes. Development of a routine for checking and issuing prescriptions will help organize the workflow.

#### *Reducing distracting factors while working*

Multitasking and distraction are the main causes of medication errors. Although the extent to which distraction at work contributes to cognitive error is unclear, recent studies [24] suggest that pharmacists' perceptions of medication errors are influenced by factors such as workflow design. Therefore, the goal of every pharmacy should be to improve the internal environment, even at the cost of patient comfort, in order to reduce medication errors.

#### *Balancing heavy workloads*

Increased workload is often cited as a contributing factor in medication errors and failure to detect prescribing errors. Sufficient staff and adequate workload will help reduce errors. Breaks and free time for lunch can help reduce some of the errors. Sharing responsibilities by clearly assigning staff tasks will help to understand workflow expectations

and can ultimately help reduce stress at work and therefore reduce medication errors.

#### *Proper organization of medications*

One way to avoid confusion between similar medicines is to store them away from each other in the medicine storage area. Using cabinets or drawers can lead to misplacement of similar medicines. It is also advisable to review medicines that have a high potential to cause errors.

#### *Checking prescriptions*

Repeated checking and cross-checking are important strategies to minimize medication errors. Comparing your written prescription with your computer product, label, and medicine will help reduce errors.

#### *Careful patient's counselling*

It is considered good practice to show the patient the packaging of the medicine when giving information about it. Completing this process will give the patient an opportunity to see the medicine and to ask if it looks different from what he took. Educating patients about the safe and effective use of medications promotes patient involvement in health care, which will help reduce medication errors.

## **Conclusions**

1872 errors were highlighted in 754 prescriptions analysed, the most common being: errors in the name of the medicines (22.54% CI<sub>95</sub>: 19.5575 - 25.5225), errors in pharmaceutical form (16.97% CI<sub>95</sub>: 14.2907 - 19.6493), lack of information about the patient (10.74% CI<sub>95</sub>: 8.5300 - 12.9500), lack of information about the doctor (90.18% CI<sub>95</sub>: 87.8780 - 92.4820) and failure to indicate the validity of prescription (87.93% CI<sub>95</sub>: 85.6046 - 90.2554). The identification and analysis of errors will lead to strategies to improve the security of healthcare systems, which will reduce the likelihood of errors and mitigate their effects. Strategies to reduce medication errors should be aimed at reducing psychological and non-psychological factors, which are represented by the environment or system in which pharmacists and doctors work.

Public and legislative intolerance of medication errors usually illustrates a lack of understanding that some errors cannot, in fact, be prevented with current technology or available resources. Human factor is always a problem, and identification of errors allows the development of improvement strategies. Blaming or punishing individuals for making mistakes does not address the causes and does not prevent the error from recurring. There is a tendency for patient's safety experts to focus on improving the safety of health care systems to reduce the likelihood of errors and mitigate their effects, rather than focusing on an individual's actions.

The need to use electronic prescription systems can be felt more than ever because of their many benefits. Electronic prescribing can prevent most prescribing

errors, but the rationality involved in prescribing medication is more of a thought process that is not yet optimal.

Patient's counselling is one of the most important strategies that every pharmacist should adopt to minimize medication errors. In addition, reporting errors as they occur and when they occur will help to learn from mistakes and will ultimately prevent such errors in the future.

### Conflict of interest

The authors declare no conflict of interest.

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