Drug prescription errors in a Brazilian hospital

Eugenie Desiree Rabelo Néri[1], Paulo Gean Chaves Gadêlha[2], Sâmia Graciele Maia[3], Ana Graziela da Silva Pereira[2], Paulo César de Almeida[4], Carlos Roberto Martins Rodrigues[5], Milena Pontes Portela[6], Marta Maria de França Fonteles[7]

[1] M.Sc. in Pharmaceutical Sciences; Risk Manager, Universidade Federal do Ceará (UFC), Fortaleza, CE, Brazil
[2] Specialist in Hospital Pharmacy; Resident in Hospital Pharmacy, UFC, Fortaleza, CE, Brazil
[3] M.Sc. in Pharmaceutical Sciences; Pharmacist at Walter Cantídio University Hospital, Fortaleza, CE, Brazil
[4] Ph.D. in Public Health; Professor, UFC, Fortaleza, CE, Brazil
[5] Ph.D. in Cardiology; Professor, Medical School, UFC, Fortaleza, CE, Brazil
[6] Specialist in Hospital Pharmacy; M.Sc. Student in Pharmaceutical Sciences, UFC, Fortaleza, CE, Brazil
[7] Post-Doctorate in Clinical Pharmacy; Professor of the Pharmacy Graduation Course and the Post-Graduation Programme in Pharmaceutical Sciences, UFC, Fortaleza, CE, Brazil

Summary

Objective: To identify the prevalence of clinically significant prescription errors in a Brazilian university hospital compared with their occurrence in 2003 and 2007. **Methods:** Variables and group of variables, such as readability, compliance with legal and institutional procedures of prescription, and prescription errors analysis were analyzed. **Results:** When the prevalence rates of clinically significant prescription errors were calculated, a statistically significant decrease was shown [year of 2003 (29.25%), year of 2007 (24.20%); ($z = 2.99$; $p = 0.03$)], reflecting on the safety rate [year of 2003 (70.75%), year of 2007 (75.80%); ($z = 3.30$; $p = 0.0001$)]. **Conclusion:** Despite significant, the increased safety rate reflected the quantitative reduction of errors, with no observed difference in severity between the studied periods. Our results suggest the institutional steps taken could reduce the number of errors, but they were ineffective in reducing the severity of the errors.

Keywords: Drug prescriptions; medication errors; medical education.

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Correspondence to:
Milena Pontes Portela
Rua Capitão Francisco Pedro, 1290, Rodolfo Teófilo
Fortaleza – CE
CEP: 60430-372
milenaportela@yahoo.com.br

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Introduction

The use of new technologies in health care has promoted improvement in quality and increased life expectancy all over the world. However, these breakthroughs have made health care increasingly expensive, complex and permeated by risks[1-3].

The negative results in patient care have received several names, such as medical errors, adverse events related to hospitalization, medicinal iatrogenics, and others. Generally, the term adverse event is used to designate unintentional damage resulting from medical treatment not related to the disease condition. Finally, the study of these events has been considered important for the quality of patient care and assurance of treatment benefit, a stimulus to the culture of health system safety and efficiency (structure, process and result)[4]. In hospital care, the most prevalent adverse events result from inappropriate use of drugs (preventable causes) or they are related to patient specificities (non-preventable causes), being divided into medication errors and adverse reactions to drugs[1,2].

Injuries resulting from errors in health services are considered the eighth leading cause of death in the United States of America[2]. Forty-four thousand to 98,000 people are estimated to die yearly from damage resulting from errors and among these, about 7,000 deaths can be attributed to medication errors[2]. In Brazil, investigations of adverse events and medication errors are incipient.

Drugs are essential components in health care and are considered the cornerstone in palliative, symptomatic and curative treatment in many diseases. However, they are also the most common cause of significant adverse reactions, errors and sentinel events[5]. Errors involving drugs occur frequently in hospitals[2,6], are multidisciplinary in nature[2] and may occur in one or more steps in the therapeutic chain (prescription, dispensation, and administration), with a higher frequency upon prescribing[7,8]. Errors have varying rates among institutions[6,9,10] and show potential to cause adverse outcomes to the patient[3], being classified as preventable adverse events[2]. Considering all kinds of errors, each hospitalized patient is estimated to experience an average of more than one medication error per day[9].

The prescription is essentially a communication tool among the physician, the pharmacist, the nurse, the caregiver and the patient. In order to be considered appropriate, in addition to being clear, the prescription must follow the World Health Organization (WHO) criteria for a rational prescription which is appropriate, safe, effective and economic[11]. These characteristics contribute to better success odds for the therapy applied and the patient's safety[3,12].

Adopting tools for a continuous improvement of the care process focused on patient safety requires addressing the theme "error", which, in health care, is still under a heavy stigma. It is often associated with low competence, shame and punishment, making it difficult to discuss study conduction, error reporting and underlying cause[3]. The current study was conducted in an error systemic view focused on processes rather than people and had the purpose of identifying the prevalence of clinically significant prescription errors compared with their occurrence in the years of 2003 and 2007 in a Brazilian university hospital as a way of evaluating the impact of the actions taken to improve safety of the prescription process.

Methods

This was a descriptive, cross-sectional, comparative study with data collection from duplicates of prescriptions containing one or more drugs. Data collection was held in two periods: June 1 to 30, 2003 (first sampling) and May 7 to 13, 2007 (second sampling) in a federal university tertiary care public hospital with 243 beds designed to the Unified National Health System (SUS) in Fortaleza, Ceará, Brazil.

Within the first sampling period, 9,482 prescriptions were dispensed by the Pharmacy, with 474 being collected (3,460 drugs prescribed). Within the second sampling period, 10,500 prescriptions were dispensed, with 140 being collected (1,030 drugs prescribed). In both samplings, 10% of dispensed prescriptions each day were selected, randomized by conglomerate (services) every other day until the size of the calculated sample was achieved. The sample size was calculated for an alpha error of 5% and the sample calculation of the first sampling was based on the lower number of errors per 1,000 items prescribed (3.2 errors) identified in literature[14]. For the second sampling, the prevalence of errors (number of errors per 1,000 items prescribed) identified in the first sampling (292.5 errors) was used as a reference for the sample calculation.

The study followed these steps: design and validation of the data collection form; team training; first sampling, coding, quality control; entries into the data base; tabulation and analysis; intervention, second sampling, coding; quality control; entries into the data base; tabulation, analysis and data comparison. The intervention measures were implemented over 4 years (administrative managing) and designed on a base of error types identified in the first sampling, namely: 1) Introduction of the daily presence of a medical preceptor into each hospital clinic instructing residents and medical students about the prescription elaboration. 2) Elaboration of a manual of good prescription practices containing tips on how to avoid prescription errors (delivered yearly to prescriptors)[12]. 3) Training about the rational use of drugs (based on the WHO method[11] and the elaborated manual[12] with a semiannual periodicity). 4) Availability of medical journals via web to the prescriptors. 5) Clinical protocol elaboration. 6) Resumption of medical-surgical sessions (monthly periodicity).

The variables or variable groups studied were:

1. Readability:

The prescription was considered unreadable when at

least two investigators had found it difficult to read what was written, resorting to the prescriptor for clarification.

2. Compliance with legal procedures[15-18]:

a) Patient's name: the completeness (no abbreviations or omissions), the readability and the patient's correct identification.

b) Prescription date and prescriptor signature: for both, presence and readability were evaluated.

c) Practice number: presence and readability were evaluated, being considered present when handwritten or imprinted.

d) Type of designation used for the drug: whether the prescribed drug was evaluated by using the commercial generic name or the chemical formula.

3. Compliance with institutional procedures:

a) Number of the patient's record, bed and admission unit: the presence, readability and accuracy were evaluated.

b) Abbreviation use: an error was considered when the abbreviations were used for the drug name, the patient's name, U and IU (for units and international units, respectively) and when they could be confused with zero[19,20].

4. Prescription error analysis:

a) Error existence: Each prescription contains one or more drug items and can contain one or more errors. Prescription errors were defined as drug prescriptions involving wrong patient, drug, dose, frequency, administration route and/or pharmaceutical formulation, inappropriate indication, double or redundant therapeutics, documented allergy to prescribed drugs, contraindicated therapy and absence of critical information (age, weight, serum creatinine, diagnosis, etc.) required for the drug dispensation and administration[21]. They still include inappropriate treatment combination[13] and inadequate duration of treatment. Prescription drug manufacturer information (package leaflets), information available from Micromedex[21] and tertiary source[22].

b) Clinically significant errors (CSE): they were identified and quantified according to Meyer[23], that is, the CSE would be that occurred as a result from a prescription decision or the elaboration process of the written prescription in an unintentional way, generating or contributing to a significantly reduced probability of a timely and effective therapy or increasing the damage risk compared with the current practice standards[24,25]. They were also used to identify the CSE existence, prescription drug manufacturer information (package inserts), information available from Micromedex[21] and tertiary source[22]. The patients' records were consulted to identify clinical conditions that could influence analyses such as weight, body area, results of laboratory tests, related symptoms (constipation, nausea, vomiting), allergy record, disease history, habits (illegal drug use, alcoholism)[26].

c) The CSE types in prescriptions were classified by Dean[27] as decision or writing errors. Decision errors were associated with the prescriptor's understanding level about the patient's clinical picture and the choice of the therapy drug. Writing errors are essential information communication failures associated with the prescription elaboration process (e.g.: prescribing a drug, but omitting the administration route when it can be administered by more than one route; prescription going to the wrong patient; prescribing the wrong drug).

d) Error severity: The CSE were subdivided into actual (detected after their occurrence) and potential (prescription mistakes which are detected and completely corrected before the drug administration). The severity was thus classified as follows: 1) For actual errors, the medication error categorization index is based on the National Coordinating Council for Medication Error Reporting and Prevention - B: an error occurred, but the patient was not reached; C: an error occurred, the patient was reached, but no damage was caused; D: an error occurred, the patient was reached, monitoring to confirm no patient's damage was caused was required and/or an intervention to prevent damage was required; E: an error occurred and it may have contributed to or resulted in transient damage for the patient, requiring an intervention; F: an error occurred and may have contributed to or resulted in transient damage to the patient, causing a hospitalization extension[28] was used. 2) For potential errors, the adapted Lesar[20] scale was used, identifying them as: AA: potentially lethal; AB: potentially serious and AC: potentially significant (with a potential to produce an adverse effect).

The Lesar[20] method adapted by Néri[3] was used to determine the prevalence of clinically significant errors (CSE) in prescriptions. The prescription process safety rate (PPSR) was calculated through the following formula: PPSR = 100% – rate of prescription CSE. The study observation units are related to individuals (patients) and drugs.

At the quality control stage, the CSE identified were evaluated independently by an intensivist and a pharmacist who is a Ph.D. in pharmacology for analysis consensus. In the case of a disagreement, a specialist physician was consulted.

Values were expressed as mean and standard deviation (X ± MSD) and processed by Epi Info. For proportion analysis, the z test was used to compare the prescrition CSE prevalence rate values and PPSR. For proportion analysis in 2 x 2 tables, non-parametrical tests were used (X^2, Fisher-Freeman-Halton). The statistical significance level considered was $p < 0.05$.

The study was approved by the Ethics Committee (protocols 193/02 and 356/05) according to the Resolution 196 of the National Health Council and the investigator was ethically obliged to intervene when an error was identified, either by preventing the error to reach the patient or by interrupting its course.

Results

The number of collected prescriptions was 474 (3,460 prescribed drugs) over the period of June 1 to 30, 2003 (first sampling) and 140 prescriptions (1,030 prescribed drugs) in May 7 to 13, 2007 (second sampling). The mean number of items per prescription was 10.77 ± 6.20 (first sampling) and 10.50 ± 5.69 (second sampling) (p = 0.645). In turn, the mean number of drugs per prescription was 7.30 ± 4.70 and 7.36 ± 4.63 (p = 0.897), respectively, for the first and the second samplings.

Table 1 shows the occurrence of errors in complying with legal and institutional procedures. Incomplete and unreadable names [2003 (n = 168), 2007 (n = 38); p = 0.06] and prescriptor's signature present but unreadable [2003 (n = 464), 2007 (n = 120); p = 0.0001] were observed.

Abbreviation use was observed in about 98% of drugs prescribed in both periods (2003, n = 3,046; 2007, n = 1,017). In 2003, abbreviations were more frequent for administration route (n = 2,980), dosing (n = 2,279), pharmaceutical formula (n = 1,783) and drug name (n = 297). In 2007, they were more frequently used in dosing (n = 634), administration route (n = 265), drug name (n = 80) and pharmaceutical formula (n = 10). The abbreviation "U" use for unit was observed in both periods.

Generic denomination was used in 66.01% (n = 2284) of prescribed drugs in 2003 and in 69.61% (n = 717) in the year of 2007 (p = 0.034). Commercial denomination was adopted, in 2003, in 30.75% (n = 1064) drugs prescribed and, in 2007, for 28.30% (n = 291) (p = 0.135). The chemical formula was used in 3.24% (n = 114) of drugs prescribed in 2003 and 2.14% (n = 22) in 2007 (p = 0.086).

Allergy information was absent in prescriptions collected and the mention to the patient's questioning about allergies was not found in 40.5% (n = 192) and 53.57% (n = 75) of medical records in 2003 and 2007, respectively (p = 0.008). Information on weight was absent in 71.94% (2003; n = 341) and 75.71% (2007; n = 106) of medical records (p = 0.436).

Table 1 – Prescription distribution according to whether there are legal and institutional components or not in a university hospital in Northeastern Brazil in the years of 2003 and 2007

Analyzed item (n^a; n^b)		Prescriptions 2003		Prescriptions 2007		X^2	p
		f	%	*f*	%		
Patient's complete and readable name? (474; 140)	No	168	35.44	38	27.14	3.34	0.06[c]
	Yes	306	64.56	102	72.86		
Correct patient? (474; 140)	No	2	0.42	1	0.71	–	0.541
	Yes	472	99.58	139	99.29		
Is the medical record number readable? (474; 140)	No	58	12.24	9	6.43	374	0.05[c]
	Yes	416	87.76	131	93.57		
Is the medical record correct? (416; 131)	No	24	5.77	4	3.05	1.51	0.219[c]
	Yes	392	94.23	127	96.95		
Is the prescription date present and readable? (474; 140)	No	17	3.59	2	1.43	1.68	0.16[c]
	Yes	457	96.41	138	98.57		
Is the practice number imprinted or readable? (474; 140)	No	16	3.38	8	5.71	1.58	0.209[c]
	Yes	458	96.62	132	94.29		
The bed number is readable? (474; 140)	No	0	0.00	1	0.71	–	2.28[d]
	Yes	474	100.00	139	99.29		
Is the bed correct? (474; 139)	No	3	0.63	0	0.00	–	0.999[d]
	Yes	471	99.37	139	100.00		
Is the admission unit readable? (474; 140)	No	23	4.85	3	2.14	1.96	0.162[c]
	Yes	451	95.15	137	97.86		
Is the admission unit correct? (451; 137)	No	14	3.10	0	0.00	4.36	0.036[c]
	Yes	437	96.90	137	100.00		
Is the prescriptor's signature present* and readable? (474; 140)	No	464	97.89	120	85.71	34.47	0.0001[c]
	Yes	10	2.11	20	14.29		

*The prescriptor's signature was present in 100% of the prescriptions analyzed. n^a, number of prescriptions analyzed in 2003 for the item at issue. n^b, number of prescriptions analyzed in 2007 for the item at issue. [c] Chi-Square Test. [d] Fisher-Freeman-Halton test; *f*, frequency.

The readability analysis of drugs prescribed revealed, in 2003, 99.54% of them (n = 3,444) were readable and, in 2007, 92.72% (n = 955) (p = 0.001). Omission of one or more items of information relevant for the dispensation safety and the prescribed drug administration was found, being identified that, in 2003, 75.35% of drugs (n = 2,607) had omission of relevant information, whereas this percentage was 79.22% (n = 816) (p = 0.012) in 2007. The omitted information was: infusion rate [2003 (78.22%, n = 2,706); 2007 (74.44%, n = 753)]; concentration [2003 (54.02%, n = 1869); 2007 (52.77%, n = 534) and pharmaceutical formula [2003 (53.12%, n = 1,838); 2007 (55.15%, n = 558)].

At the first sampling (2003), 8,271 prescription errors were identified in 474 prescriptions containing 3,460 drugs prescribed and, out of these errors, 12.24% (n = 1012) were CSE, with this number ranging from 1 to 10 CSE/prescription (mean = 2.60 ± 0.10). In 2007, all prescriptions had errors (n = 140), adding up to 2,608 errors for 1,030 drugs prescribed, from which 9.55% (n = 249) were CSE, ranging from 1 to 9 CSE/prescription (mean = 2.50 ± 1.80). By adding the two-period errors and dividing by the total prescriptions collected, a mean of 2 CSE/prescription was obtained, with 75.34% (n = 950) of errors concentrated in the writing process. The drugs most frequently involved in CSE, in both samplings, were dipyrone [2003 (11.74%); 2007 (10.03%)], regular insulin [2003 (7.28%); 2007 (8.70%)] and digoxin [2003 (3.53%); 2007 (10.03%)].

The CSE were categorized into writing and decision errors. The error percentage occurred in the writing process was, in 2003, 75.39% (n = 763) and, in 2007, 75.10% (n = 187) (p = 0.987) (Table 2).

As for errors in the decision process, in 2003, the occurrence of 249 CSE (24.6%) and, in 2007, 24.90% (n = 62) (p = 0.961) was observed. The types of decision errors and their frequencies are shown in Table 2.

In 2003, 98.4% (n = 112) of CSE were potential errors and, in 2007, 100% (n = 249). As for severity, CSE were distributed as shown in Table 3.

When prescription CSE prevalence rates were calculated, in 2003, 29.25% and, in 2007, 24.20% were identified (z = 2.99; p = 0.003), creating a prescription process safety rate, in 2003, of 70.75% and, in 2007, 75.80% (z = 3.30; p = 0.0001).

Discussion

The results achieved bear out findings in Brazilian and international studies[6,8,19,29-32] and showed prescription errors are common and should be faced by practitioners involved in health care, mainly in teaching hospitals, in which the safety culture, if incorporated over the practitioners' graduation, can result in health system changes.

The prescriptions analyzed in both phases had a mean number of items and drugs statistically similar, indicating the reproducibility of the method used, as well as the fact that patients are given a polypharmacy, favoring error occurrence[3,30]. The mean number of drugs per prescription was similar to that found by Cruciol-Souza[33] in a teaching hospital in Paraná, stressing the need of a higher level of attention to prescriptions in this specific hospital group because of the confluence of factors associated with the higher error tendency[3].

The prescriptor's name, his/her signature and practice number in the Council, when associated, give the prescription legal validity and, when this information is unreadable or missing, prescriptions should not be dispensed or fulfilled. This legal optics further contains discussions that are of technical and practical in nature, making the hospital routine more difficult. The results obtained in 2003 and 2007 regarding the prescriptor's identification, were better than Sebastião's[34], who identified the practice number was missing in 83% of prescriptions, the prescriptor's signature in 19.2% and the

Table 2 – Prevalence of main types of clinically significant errors in writing and decision processes identified in the years of 2003 and 2007 in a university hospital in Northeastern Brazil

Type	2003		2007		Z	p
	f	%	*f*	%		
Error in the writing process	(n = 763)[a]		(n = 187)[a]			
One or more items of the patient's identification are missing	210	27.5	43	23.0	1.16	0.248
Ambiguous/confused prescription	210	27.5	33	17.6	2.69	0.007
Infusion rate missing*	111	14.5	27	14.4	0.08	0.935
Error in the decision process	(n = 249)[b]		(n = 62)[b]			
Potentially significant drug interaction	150	60.2	29	46.8	1.77	0.077
Prescription of a drug not indicated for the patient	21	8.4	8	12.9	0.85	0.397

*Drugs requiring the information to assure the dispensation and administration safety. [a] The number between brackets represents the total errors in the writing process; [b] The number between brackets represents the total errors in the decision process; *f*, frequency.

Table 3 – Distribution of clinically significant prescription errors according to severity identified in the years of 2003 and 2007 in a university hospital in Northeastern Brazil

Type	2003		2007		Z	p
	f	%	*f*	%		
AA – Potential error: Potentially fatal	79	7.8	16	6.4	0.62	0.538
AB – Potential error: Potentially serious	200	20	48	19	0.09	0.929
AC – Potential error: Potentially significant (with potential to produce an adverse effect)	717	71	185	74	1.02	0.309
B – Actual error: an error occurred, but it did not reach the patient	1	0.1	–	–	0.75	0.453
C – Actual error: an error occurred, reached the patient, but it caused no damage	2	0.2	–	–	0.18	0.859
D – Actual error: an error occurred, reached the patient, monitoring to confirm it had not resulted in damage to the patient was required and/or an intervention to prevent the damage was required	6	0.6	–	–	0.71	0.475
E – Actual error: an error occurred and it may have contributed to or resulted in transient damage to the patient, requiring an intervention	6	0.6	–	–	0.71	0.475
F – Actual error: an error occurred may have contributed to or resulted in transient damage to the patient, causing a hospitalization extension	1	0.1	–	–	0.75	0.453
Total	1,012	100	249	100	–	–

f, frequency.

practitioner's name in 45.2%. The prescriptor's signature readability had a statistically significant improvement between 2003 and 2007.

In addition to the items aforementioned, the date provides the prescription with validity which, in a hospital setting, usually lasts 24 hours. When the date is considered, the results achieved in the samplings are similar to Sebastião's[33] (97.2%) and Miasso's[29] (96%), but higher than Rosa's[19] (90.6%).

The use of abbreviations and symbols in prescriptions is pointed as an error-related factor[18,19], and at times these errors are fatal[35]. Several prescriptors see abbreviation use as a way of saving time, however they have no thoughts of the time spent by the other practitioners in clarifying the doubts[35] and of the risks resulting from mistaken interpretations. Moreover, the abbreviation use is contrary to the Decree no. 20.931/32[14], which determines the prescription must be made in full and must not be made in a secret mode. The practice of abbreviations was widely identified in both samplings, being similar to Miasso's[29] results, with the drug name abbreviation and use of "U" for "unit" being highlighted, both facts described by Cohen[36] as significant safety issues. The use of "U" is included in the abbreviation list prohibited by the Joint Commission on the Accreditation of Health Care Organizations[35]. In Brazil, in 2007, the National Health Surveillance Agency (Anvisa) discussed the standardization of names, concepts and abbreviations in pharmaceutical forms of drugs to assure a common understanding[37].

The use of the generic denomination in prescription in both study years was twice the value found by Sebastião (30.2%)[34]. By comparing the years of 2003 and 2007, a significant increase in generic denomination adoption was shown, but the legal provision regulating the issue has not been wholly fulfilled[17].

Information such as weight and allergy report is a basic tool for the safety of drug dispensation and administration[3]; however, this data is often missing in the medical record and in a similar level in both periods, in agreement with Devine's[38] data. Concerning allergy, there was a significant increase in the percentage of medical records missing an answer the patient should have given to the question asked about it, which is worrisome, since the non-documentation exposes health care users to an unnecessary and preventable damage risk. According to Runciman[39], over 75% of prior drug allergic reactions are not found in the medical record. This data stresses the need of further emphasis on good documentation practice adoption during the prescriptor's training[3].

The low readability of prescriptions, mainly those handwritten[19,29], has been indicated as a major cause for communication failure among practitioners involved in hospital care and a factor contributing to medication errors[19,29,30,32,40,41]. Despite showing a readability result over 90%, a significant reduction in prescription readability was found between 2003 and 2007, indicating a higher probability of patient damage. These findings can be minimized from the adoption of the electronic prescription[42] and stress the need of a review in the prescriptor's training[43].

Similarly, information missing is considered a major fault in the prescription process, negatively influencing the communication quality[29,33]. When this indicator was evaluated, a significant increase in the percentage of missing information relevant to the safety of drug dispensation and administration was observed. The concentration and pharmaceutical formulation figure among the information most frequently missing in both samplings, an issue also reported by Rosa[19], Miasso[29] and Sebastião[34] in other Brazilian hospitals. The infusion rate missing also identified can lead to an Adverse Drug Reaction infusion rate-dependent, as in the case of the red man syndrome related to the quick vancomycin infusion[3].

The analysis by segment revealed writing errors had a similar behavior and represented more than three quarts of the total in both periods. In this setting, the results were similar to Rosa's[19], Devine's[38] and Dean's[44]. The writing errors also had a similar behavior between 2003 and 2007. Decision errors are considered more complex to be prevented than the writing errors[3].

Among the writing CSE, missing patient identification items (name, medical record number, bed, clinic or service where he/she was admitted) were predominant, making higher the chance of a patient receive drugs that were not prescribed for him(her) and suffer damage resulting from this exchange[7]. In this study, the patient's name on the prescription had a high inadequacy (incomplete, with an abbreviation, and unreadable) percentage, contributing to a prescription exchange between namesakes, a possibility already described in literature[44] which can be prevented through the patient's appropriate identification.

The ambiguous/confused prescription had its percentage significantly reduced, comparing 2003 with 2007, but this result still represents twice the frequency identified by Ridley[32] in a prescription study in an intensive care unit (ICU).

Regarding CSE in the decision process, the prevalence was observed as similar in both periods, but they had a lower frequency than writing errors, with a significantly reduced tendency for drug interaction being observed. The severity of the decision errors, according to Dean[44], is greater than that with writing errors. The lack of knowledge and information about the patient was pointed by Louro[30] as a factor related to prescription errors.

Drug interaction and drug prescription with no indication for the patient were predominant decision errors in the samplings, and occurrence percentage of the interaction, in relation to the total CSE identified, was about three to five times as high as those identified by Devine[38] (2.8%) and Louro[30] (3.4%), respectively. The percentage of clinically significant drug interactions identified in this study was similar to that obtained by Hammes[45] in an ICU in Santa Catarina, Brazil. When the prescription of a contraindicated drug for the patient according to preexisting conditions reported in the medical record was analyzed, a significantly increased occurrence was found. Both errors are relevant and deserve to be considered in the reflection process aiming at the prescriptors' teaching improvement[46].

The analysis of three drugs more frequently involved in CSE revealed that two of them are classified as potentially dangerous drugs associated with more serious errors[19]. In this study and in Devine's[38] study, most errors were potential, with the minority of them being classified as potentially fatal. Regarding the actual errors, some of them reached the patient, resulting in a transient damage, with a prevalence 3.4 times as higher as that identified by Devine[38] (0.2%).

The prescription CSE prevalence rate suffered a significant reduction between the periods and had a mean percentage similar to Devine's (27.4%)[38]. The reduced CSE prevalence rate, resulting from the quantitative reduction of clinically significant errors, provided a significant increase in this process safety rate; however, a reduced severity in the errors identified between the periods was not found.

Factors contributing mostly to elevate the PPSR were the increased percentage of a correct recording of the patient's hospitalization unit, signature readability on the prescription, increased generic denomination use and reduction of drugs prescribed in an ambiguous/confused way.

The findings suggest an improvement of the prescription process quality between the study periods, but there was no influence on the error severity. Ross[46] reports there is little evidence in the present literature instructing medical schools on how to prepare students to prescribe and that the use of the WHO Guide for a Good Medical Prescription[11] is the only model with evidence of prescription improvement. The WHO method was adopted in this study and may have contributed to reduced ECS. The reduced occurrence of errors following the education program adoption focused on prescriptors was also shown by other authors[4,18,24].

Conclusion

The prescription process is complex and permeated by errors. Prescription errors are usually multifactorial and arise from active faults or conditions error-inducing, usually acting together to cause them. Face of this complexity, solutions involving only one cause, such as lack of knowledge, seem to have limited benefits.

The confrontation of the prescription error issue is a world challenge and must be an institutional goal. In this study, the statistical increase in the prescription process safety rate was identified, influenced by the quantitative reduction in clinically significant errors between 2003 and 2007, but the error severity was not changed, indicating the steps taken were ineffective in reducing the severity.

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