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RESEARCH

PRESCRIPTIONS AND SCHEDULING OF ENDOVENOUS MEDICATIONS IN PEDIATRICS: DESCRIPTIVE STUDY

PRESCRIÇÕES E APRAZAMENTOS DE MEDICAMENTOS ENDOVENOSOS EM PEDIATRIA: ESTUDO DESCRITIVO

PRESCRIPCIONES Y HORARIOS DE FÁRMACOS ENDOVENOSOS EN PEDIATRÍA: ESTUDIO DESCRIPTIVO

Rafaela de Oliveira Mota[1]
Cristina Oliveira da Costa[1]
Eva Anny Welly de Souza Brito[1]
Thais Lima Vieira de Souza[1]
Lilia Jannet Saldarriaga Sandoval[1]
Ires Lopes Custódio[1]
Francisca Elisângela Teixeira Lima[1]

[1]Universidade Federal do Ceará - UFC, Faculdade de Farmácia, Odontologia e Enfermagem - FFOE, Departamento de Enfermagem - DE. Campus do Porangabuçu. Fortaleza, CE - Brazil.

Corresponding author: Rafaela de Oliveira Mota
E-mail: rafa.mota.ufc@outlook.com

Authors' contributions:
Conceptualization: Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Francisca E. T. Lima; ***Data Collection:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Investigation:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Methodology:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Francisca E. T. Lima; ***Project Management:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Francisca E. T. Lima; ***Statistical Analysis:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza; ***Supervision:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Validation:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Visualization:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Writing - Original Draft Preparation:*** Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima; ***Writing - Review and Edition:*** *Rafaela O. Mota, Cristina O. Costa, Eva A. W. S. Brito, Thais L. V. Souza, Lilia J. S. Sandoval, Ires L. Custódio, Francisca E. T. Lima.*

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Luciana Regina Ferreira da Mata

ABSTRACT

Objectives: to analyze the prescriptions and scheduling of intravenous medications for hospitalized children and adolescents, following the recommendations of the Safety Protocol in the Prescription, Use, and Administration of Medicines. **Methods:** descriptive, documentary study, with analysis of 352 prescriptions for intravenous medications in pediatric inpatient units. The age range of the children was 29 days up to 16 years old. Data collection took place from August to November 2017. A checklist-type instrument was used. The analysis was performed using descriptive statistics, in compliance with ethical precepts. **Results:** we found that the performance was satisfactory concerning the prescriptions and followed the recommendations of the Ministry of Health of Brazil. The essential items in medication prescriptions had the following incidences: date (98%), generic name (95.2%), concentration (98.6%), dose (99.7%), route of administration (95.7%), dosage (98.9%), guidelines (87.5%), physician's signature (99.1%), medical stamp (97.7%), nurse's signature (93.2%) and nurse's stamp (84.7%). In the 352 prescriptions, 1,069 medications were analyzed, of which 1,059 (99.06%) presented satisfactory data regarding the verification of intravenous medications. **Conclusions:** most of the prescription items were satisfactory; however, some items were considered unsatisfactory, with actions not performed correctly.

Keywords: Patient Safety; Drug Prescriptions; Security Measures; Inpatient Care Units; Pediatric Nursing; Adolescent; Child.

RESUMO

Objetivos: *analisar as prescrições e o aprazamento de medicamentos endovenosos a crianças e adolescentes hospitalizados, de acordo com as recomendações do Protocolo de Segurança na Prescrição, Uso e Administração de Medicamentos.* ***Métodos:*** *estudo descritivo, documental, com análise de 352 prescrições de medicamentos endovenosos, em unidades de internação pediátrica. A faixa etária das crianças era de 29 dias até 16 anos de idade completos. Coleta dos dados ocorreu de agosto a novembro de 2017. Utilizou-se instrumento do tipo checklist. A análise foi realizada por meio da estatística descritiva, obedecendo aos preceitos éticos.* ***Resultados:*** *constatou-se que o desempenho foi satisfatório em relação às prescrições e estavam de acordo com o recomendado pelo Ministério da Saúde do Brasil. Os itens essenciais nas prescrições medicamentosas apresentaram as seguintes incidências: data (98%), nome genérico (95,2%), concentração (98,6%), dose (99,7%), via de administração (95,7%), posologia (98,9%), orientações (87,5%), assinatura do médico (99,1%), carimbo médico (97,7%), assinatura do enfermeiro (93,2%) e carimbo do enfermeiro (84,7%). Nas 352 prescrições, analisaram-se 1.069 medicamentos, dos quais 1.059 (99,06%) apresentaram dados satisfatórios quanto à checagem dos medicamentos endovenosos.* ***Conclusões:*** *a maioria dos itens da prescrição foi satisfatória, contudo, alguns itens foram considerados insatisfatórios, tendo ações não realizadas corretamente.*

Palavras-chave: *Segurança do Paciente; Prescrições de Medicamentos; Medidas de Segurança; Unidades de Internação; Enfermagem Pediátrica; Criança; Adolescente.*

RESUMEN

Objetivos: *analizar la prescripción y programación de medicamentos endovenosos para niños y adolescentes hospitalizados, de acuerdo con las recomendaciones del Protocolo de Seguridad en la Prescripción, Uso y Administración de Medicamentos.* ***Métodos:*** *estudio descriptivo, documental, con análisis de 352 prescripciones de medicamentos endovenosos en unidades de hospitalización pediátrica. El rango de edad de los niños fue de 29 días a 16 años. La recolección de datos se llevó a cabo de agosto a noviembre de 2017. Se utilizó un instrumento tipo lista de verificación. El análisis se realizó mediante estadística descriptiva, cumpliendo con los preceptos éticos.* ***Resultados:*** *se encontró que el desempeño fue satisfactorio con relación a las prescripciones y estuvo de acuerdo con lo recomendado por el Ministerio de Salud de Brasil. Los ítems esenciales en la prescripción de medicamentos tuvieron las siguientes incidencias: fecha (98%), nombre genérico (95,2%), concentración (98,6%), dosis (99,7%), vía de administración (95,7%), posología (98,9%), directrices (87,5%), firma del médico (99,1%), sello médico (97,7%), firma de la enfermera (93,2%) y sello de la enfermera (84,7%). En las 352 prescripciones se analizaron 1.069 medicamentos, de los cuales 1.059 (99,06%) presentaron datos satisfactorios en cuanto a la verificación de medicamentos en-*

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dovenosos. ***Conclusiones:*** *la mayoría de los ítems de prescripción fueron satisfactorios, sin embargo, algunos ítems se consideraron insatisfactorios, con acciones no realizadas correctamente.*

Palabras clave: *Seguridad del Paciente; Prescripciones de Medicamentos; Enfermería Pediátrica; Medidas de Seguridad; Unidades de Internación; Adolescente; Niño.*

INTRODUCTION

Patient safety in health care has been, currently, constantly debated about the hospitalized patient. The multidisciplinary team is extremely important for promoting and maintaining safe care, especially in a hospital environment, which is influenced by factors that can intensify the chances of events that affect the recovery process of assisted patients.

The World Alliance Program for Patient Safety was established by the World Health Organization (WHO), to adopt methods to ensure the improvement of care provided to patients in health institutions in member countries. In 2017, the third global patient safety challenge was instituted, with the theme "safe use of medicines", aiming to reduce 50% of serious and preventable damage related to medicines over the next five years, from the development of safer and more efficient health systems in every medication process.[1-3]

In 2013, the National Patient Safety Program (*Programa Nacional de Segurança do Paciente*) was implemented in Brazil aimed to monitor and prevent health care damage, through the implementation of basic protocols defined by the Brazilian Ministry of Health (MH). One of these protocols is the Prescription Safety Protocol, Use and Administration of Medicines.[3]

The medication system consists of actions produced by health professionals to promote health through the use of medication. This system has three processes: prescription, dispensing, and administration. The medical professional is responsible for prescribing medical care, including the prescription of medication. The pharmacist is responsible for carrying out the pharmacotherapeutic follow-up of patients in all health institutions. In Brazil, mid-level and higher education Nursing professionals are responsible for administering the medications, understood as the action of offering the prescribed medication, which is an important step to prevent errors in the patient's drug therapy.[4-7]

In Pediatrics, patient safety is a greater challenge, as this population is more vulnerable to the occurrence of medication errors due to peculiarities of this pediatric public and the unavailability of formulations of medications suitable for children. Approximately 80% of drugs used in adults are also used in children and newborns.[7]

Medication prescriptions are important legal documents for communication between health professionals, in addition to guiding the implementation of the health care of patients, in the different stages of the medication system.[7]

The use of medications in children presents additional challenges. Off-label use is one of these risks, occurring when a medication is prescribed for treatment different from the indication in the package insert, change in the administration route, and the number of times the medication is administered, among other factors. Unauthorized drug adoption is widespread around the world, which can increase the risk of harm associated with preventable medication. A small error in the dose of medication in children has a greater risk of harm than in the adult population. Pediatric prescribing also requires weight-related dose adjustment and other dosage calculations, which are less commonly found in prescribing for adults.[8,9]

The most common medication errors related to prescription are the medication dose, administration routes, legibility of prescriptions, absence of records in prescriptions, incorrect infusion presentation and rates, schedules against prescription, incorrect preparations, failures in aseptic techniques at the time of the preparation, and administration of medicines, among others.[10]

Our interest in the topic was due to the need to know the characteristics of intravenous medication prescriptions and the scheduling of intravenous medication in the context of Pediatrics, to prevent situations that could jeopardize the safety of pediatric patients undergoing drug therapy to find strategies that can minimize errors. The Nursing team can intercept 90% of medication errors before reaching the patients. Therefore, Nursing is the last barrier to avoid errors.[11]

Given these considerations, recognizing the importance of the problems involving drug prescriptions and the safe scheduling of intravenous medications in Pediatrics, and the repercussion that errors in the performance of these activities of professionals who provide health care can cause, we sought to answer the guiding question: are the prescriptions of intravenous medications in Pediatrics following the Safety Protocol in the Prescription, Use and Administration of Medicines guided by the MH? Based on this question, this investigation aimed to analyze the prescriptions and scheduling of intravenous medications for hospitalized children and adolescents, following the recommendations of the Safety Protocol in the Prescription, Use, and Administration of Medicines.

METHOD

This is a descriptive, documentary, quantitative study, carried out in a pediatric tertiary care hospital in *Fortaleza* - CE, Brazil.

To calculate the number of prescriptions, we adopted the sample calculation for finite populations, considering that prescriptions for intravenous medications are carried out daily and there are approximately 300 inpatient beds in the hospital. Thus, there are about 300 prescriptions a day. Therefore, 30x300=9,000 prescriptions/month, and when considering the universe of six months, there will be about 54,000 prescriptions. The 95% confidence level, 5% sampling error, was considered as a parameter.

The sample consisted of a total of 352 prescriptions for intravenous medications in pediatric inpatient units. After data collection, there was no sample loss in the study. The study population was represented by prescriptions for children older than 29 days up to 16 years old, comprising infants, preschool, school, and adolescents hospitalized in an open unit in that institution. For the age, we adopted the Ministry of Health classification, which considers infants to be children aged 29 days to <2 years old; preschool-age two to <7 years old; school aged 7 to <10 years old; and teenagers from 10 to 19 years old.[12]

We included in the study, the prescriptions of children who met the following inclusion criteria: between 29 days and 16 years old; hospitalized for at least three days in an open inpatient unit, and using intravenous medications. The selected prescription was for the third day of hospitalization, as we observed that in the researched institution this was the period in which drug therapy was established, showing more accurately the reality of these prescriptions.

The data collection of this study took place between August and November 2017, using an instrument that follows the recommendations of the protocol[3], containing the variables: prescription (date of prescription, generic name of the drug, drug concentration, dosage forms, dose, diluent, administration routes, infusion rate, dosage and guidelines on the use of the drug, types of prescriptions (electronic, handwritten, electronic and handwritten), clarity (readability, erasures, use of abbreviations and use of vague terms), identification of the prescriber (stamp and signature), stamp and signature of the nurse, abbreviations (intravenous, distilled water, saline, temperature, glucose solution, if necessary, continuous infusion pump, intravenous, at medical discretion), vague terms (if necessary, slow, at medical discretion, standard dilution), scheduling, potential drug interactions and checking of drugs administered intravenously. The answer options were: yes, no, partial, and not applicable, as well as space for annotation of observations. The complete form for the institution's medical prescriptions was considered a prescription.

Data were stored and analyzed in an electronic spreadsheet. For this, we considered the recommendations of the protocol regarding the prescriptions of drugs administered intravenously.[3]

The analysis was based on descriptive statistics, considering absolute and relative frequencies. Data were discussed and substantiated based on relevant literature on the topic, as recommended by the Ministry of Health, with satisfactory performance being considered as the one whose percentages were equal to or greater than 80%, following another study developed.

The study followed the recommendations of the Resolution No. 466/201213 of the National Health Council (*Conselho Nacional de Saúde-CNS*), which governs the process of development of research with human beings, being approved.

RESULTS

The results obtained by evaluating the 352 prescriptions showed from one to eight medications prescribed for intravenous administration, totaling 1,069 medications. They were organized in tables, considering the information regarding the intravenous prescription and identification of the professional.

Table 1 shows data referring to essential information that must be included in the prescriptions.

Table 1 - Distribution of essential information on the prescription of intravenous medications, according to the recommendations of the Safety Protocol in the Prescription, Use, and Administration of Medicines. *Fortaleza*, CE, Brazil, 2017

Essential Prescribing Information	N=352	%
Date	345	98.0
Generic name of the medication	335	95.2
Concentration	347	98.6
Pharmaceutical form	2	0.6
Dose	351	99.7
Diluent	252	71.6
Diluent volume	260	73.9
Route of administration	338	96.0
Infusion rate	22	6.25
Dosage	348	98.9
Guidelines (N= 281)	246	87.5

Regarding the 11 items related to essential information on the prescription of intravenous medications, the data showed satisfactory results for seven of these items (Table 1).

For the item guidelines, we considered prescriptions that presented symptomatic medications through the intravenous route (n=281). Symptomatic drugs were those used to treat symptoms such as nausea, pain, or fever. The guidelines regarding the use of symptomatic medications were: in the case of dipyrone, the guidance was "if pain or fever", "if pain or temperature greater than 37.5ºC"; in the case of bromopride, it was "nausea or vomiting".

Table 2 addresses prescription characteristics regarding the type of prescription, clarity, and identification of the prescriber.

Table 2 - Distribution of prescriptions regarding the quality of prescriptions for intravenous medications, according to the Protocol's recommendations. *Fortaleza*, CE, Brazil, 2017

Prescription characteristics	N=352	%
Type of prescription		
Eletronic	271	77.0
Handwritten	19	5.4
Eletronic and Handwritten	62	17.6
Prescription clarity		
Readable	349	99.1
Absence of erasures	299	84.9
Absence of abbreviations	14	4.0
Absence of vague terms	294	83.5
Prescriber identification		
Doctor's signature	349	99.1
Doctor's stamp	344	97.7
Nurse's signature	328	93.2
Nurse's stamp	398	84.7

The types of prescriptions identified were 271 (77.0%) electronic, 62 (17.6%) mixed (electronic and manual) and 19 (5.4%) only handwritten. Regarding clarity, 99.1% of the prescriptions were readable. For the items "absence of erasures" and "absence of vague terms", the results showed that 15.1% and 16.5% of the prescriptions had erasures and vague terms, respectively.

Table 3 shows the abbreviations and vague terms that were verified in the prescriptions.

In 338 of the 352 prescriptions, we found abbreviations such as EV (96.4%), DW (84.0%), and S (64.8%); and 62 (17.6%) had vague terms, highlighting: if necessary (50.0%), without specifying the patient's clinical conditions that indicated the need to administer the medication; and slow (34.5%), without prescribing the drops or infusion time of the drug.

Table 3 - Distribution of prescriptions regarding abbreviations and vague terms in prescriptions for intravenous medications. *Fortaleza*, CE, Brazil, 2017

Abbreviations detected	N	%
Endovenous (EV)	326	96.4
Distilled water (DW)	284	84.0
Saline solution (SS)	219	64.8
Temperature (T, TX, TAX, TEMP)	175	51.8
Glucose serum (GS)	32	9.5
If necessary (IN)	29	8.6
Continuous Infusion Pump (CIP)	21	6.0
Intravenous (IV)	12	3.6
At medical discretion (AMD)	11	3.3
Vague terms detected		
If necessary	29	50.0
Slow	20	34.5
At medical discretion	11	19.0
Standard dilution	2	3.4

We identified the occurrence of 83 doses of intravenous medications scheduled at the same time.

Of the 352 prescriptions evaluated, 1,069 medications were analyzed, of which 1,059 (99.1%) presented satisfactory data regarding the verification of intravenous medications.

DISCUSSION

We obtained satisfactory results in the analysis of prescriptions for intravenous medications in Pediatrics. However, some items analyzed deserve attention regarding non-compliance with the recommendations in the literature relevant to the topic.

The predominant type of prescription was electronic, being considered a factor to strengthen patient safety in prescriptions, consequently leading to a reduction in medication errors related to non-understanding of prescribed medications.

The aforementioned institution had computers so that medical professionals could enter electronic drug prescriptions.

According to the Safety Protocol of Drug Administration, the use of prescriptions typed in a computer (electronic) is recommended as a way to improve the readability and understanding by professionals. On the other hand, handwriting (manual) prescription can increase the chances of errors. It is recommended that

drug prescriptions be free from abbreviations, as they increase the possibility of medication errors.[3]

According to the Code of Medical Ethics, the Resolution No. 1931, of September 17, 2009, of the *Conselho Federal de Medicina* (CFM), in its article 39, which deals with the medical professional responsibility, it is incumbent upon the physician to write readable prescriptins.[14]

A study developed with 250 nurses in a teaching hospital in Iraq found frequent errors in drug administration, with illegible prescriptions were one of the main factors related to errors in this process.[15]

A study carried out in the province of Gauteng, South Africa, analyzed the incidence of errors in medication administration, with 296 errors being identified. Of the 1,847 drug administrations observed, the majority of errors were related to the administration at wrong times and dose and incorrect identification of patients. These were directly related to the quality of prescriptions, the timing, and correct execution by Nursing professionals.[16]

In a pediatric hospital in Ethiopia, medication administration was observed in 1,251 pediatric patients, in which 62.7% had errors, the main ones being related to dose, time, omission in administration, incorrect patient, administration of non-prescribed medications.[17]

Prescriptions must be composed of all essential information for professionals who use them, as the absence of information can contribute to the occurrence of errors.[18]

A review study carried out in 2015 points out that the incorrect infusion rate and the form of presentation, among other medication errors, are among the most frequent, being non-compliances related to the prescription. In the same study, in an interview with medical, Nursing, and pharmacy professionals, 29% cited medical prescription as one of the most common medication errors.[10]

An investigation conducted at a university hospital in the United States analyzed 321 reports of medication-related errors, of which 72.5% were related to prescription; 14.6% to the administration; 6.6% upon dispensing; and 6.3% to transcription. Nursing can stop the incidence of up to 86% of errors in the prescription, transcription, and dispensing processes.[18]

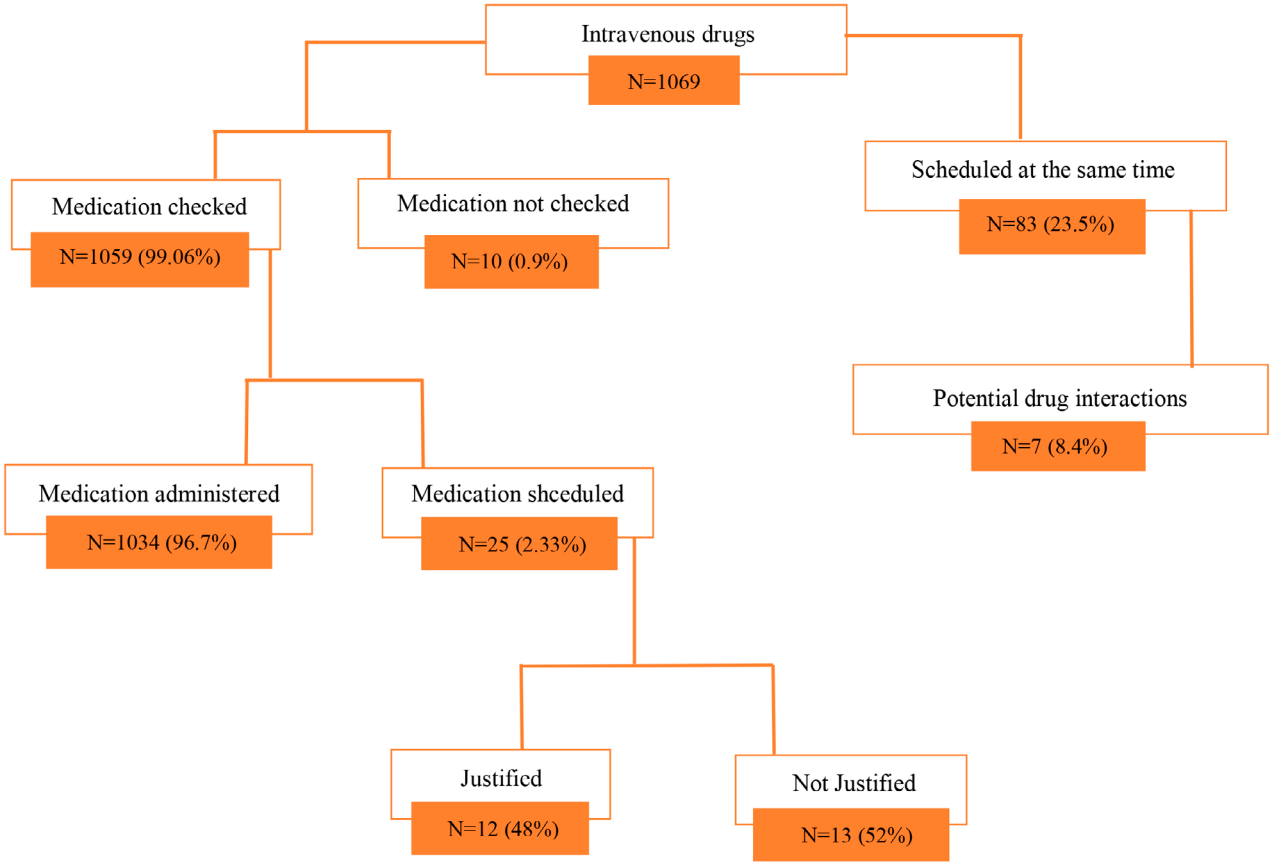

Figure 1 - Flowchart of intravenous drug doses regarding scheduling, potential drug interactions, and checking of drugs administered intravenously in Pediatrics. *Fortaleza*, CE, Brazil 2017

Suppressing failures related to the prescription and scheduling process hinders to carry out actions aimed at preventing consequences for the patient, and preventing the occurrence of harmful errors to patients.[19]

Regarding the use of abbreviations, the most frequently used were endovenous (EV) (326 cases), distilled water (DW) (284 cases), saline solution (SS) (219 cases), temperature (T-TX-TAX -TEMP) (175 cases). Writing that makes it difficult for professionals to read and the use of paronymous abbreviations contribute to the increased incidence of errors.[20]

The use of abbreviated terms is a way to reduce prescription time, but these prescriptions may not be clear and may confuse professionals who do not know the meaning of the terms used. The use of abbreviations and/or symbols in prescription is an action that goes against the recommendations of the relevant literature.[21]

The medical prescriber's identification must contain the full name, professional council registration number, and signature. The registration with the identification of the professional can be written or using a stamp with identification. Prescriber data must be legibly recorded so that it can be identified, providing authenticity to the prescription.[3]

This study shows that, in most prescriptions, medical professionals and nurses stamped and signed the prescriptions of patients to whom they provided care. On the other hand, a study carried out in *Goiás*, Brazil, in which 639 medical prescriptions were analyzed, revealed that in 12.1% of these, the signature and stamp containing the full name and registration number in the respective professional council were not identified (only two, in special prescription). Another study carried out in a public hospital in the Federal District, Brazil, which analyzed safety prescriptions, found that the prescriber's name and CRM were absent in 98.3% of electronic prescriptions.[21,22]

However, as this is the identification of the professional who acted, it is recommended that 100% of the prescriptions and schedules be signed and stamped by medical professionals and nurses.[3]

In Brazil, the nurse is responsible for the scheduling of medications, including intravenous ones, when the prescription is released, and the Nursing technician is responsible for the preparation and administration of most medications. The scheduling of medications, if not properly planned, can lead to adverse events. Nurses need to evaluate the medications contained in the pharmacotherapeutic plan, showing knowledge about medications related to the variety and convenient way of using the medications.[23]

In this study, although many drugs are scheduled at the same time, most of them (92.9%) did not constitute drug interactions, but some showed potential interactions (7.1%). Therefore, nurses should avoid scheduling medications at the same times, as simultaneous administrations can generate serious interactions between the medications administered. Administering medications at different times can be a strategy to reduce potential drug interactions, indicating the use of different schedules personalized by the patient in the scheduling of medication. The *Conselho Federal de Enfermagem* (2017) recommends that, in all cases of Nursing appointments or notes, nurses must register their signature or initials on the stamp.[23,24]

The fact of checking the medications administered demonstrates that the prescribed medication was prepared and administered. The professional who prepares the medication and administers it is also responsible for checking the prescription when it is administered to the patient. In this study, more than 99% of the prescriptions were correctly checked for medication. On the other hand, a study carried out in the Federal District, in which the prescriptions were analyzed, showed that 31.1% of the medications were not checked, which contributes to a decrease in safety in the medication process.[22]

According to the findings of this study, some items were considered unsatisfactory, with actions that were not performed correctly and that goes against the recommendations in the literature. However, this study verified the reality of only one institution, so we recommend further studies in other institutions so that an overview of other health establishments can be obtained.

A strong point of this study was the use of the Safety Protocol in Drug Administration to build an instrument for collecting data on medication prescriptions. Furthermore, this manual describes strategies used in the studied institution, and other institutions, being one of the ways to prevent errors and learn about the problems present in the prescription of medicines in Pediatrics, being possible to use this information to improve the quality of prescriptions in Pediatrics.[3]

It is important that sectors responsible for patient safety in institutions, in addition to overseeing, adequately train professionals so that they become multipliers of safe care, resulting in the reduction of high rates of non-compliance and errors related to medication.

Among the limitations of this study, the research was carried out in only one institution. Also, the data obtained in pediatric inpatient units may not represent the reality of other units, such as the intensive care unit, pediatric oncology, among others.

We recommend carrying out this study in other institutions in different sectors, so that we can compare the differences between the high and low levels of complexity, such as closed hospitalization units, postoperative recovery rooms, pediatric oncology, among others.

CONCLUSION

We can conclude that most of the prescriptions of the institution where the study was carried out are being carried out electronically, reducing the possibility of erasures and errors due to misunderstanding of the spelling.

Most prescriptions had the professionals' identification and stamp. In the medication schedules, there was a small record of cases in which medications were scheduled at the same time and were related to severe to moderate drug interactions.

The findings of this research can be used as a baseline for future studies in other environments and health institutions, since the prescription of drugs and their schedules is one of the activities most frequently performed by medical professionals and nurses, respectively.

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