



ORIGINALES

Safety in drug administration: Research on nursing practice and circumstances of errors

Segurança na administração de medicamentos: Investigação sobre a prática de enfermagem e circunstâncias de erros

Seguridad en la administración de medicamentos: investigación sobre la práctica de enfermería y circunstancias de errores

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ABSTRACT:

Introduction: To provide safe, effective, timely and individualized care is a major challenge in health care. Currently, the main errors in health care are related to medication errors. These errors can cause damages, especially in pediatrics, because of organs' immaturity and variation in the weight and body surface. In this way, the importance of nursing in this scenario is perceived to guarantee a safe care.

Objective: To investigate the practice of nursing professionals about drug administration process, as well as the circumstances that lead to errors.

Method: Descriptive, quantitative study with 147 nursing professionals in Neonatal and Pediatric Intensive Units. To collect data, a questionnaire was used elaborated and based on the recommendations of the Guideline for Prevention of Intravascular catheter-related infections with questions related to the practice of drug administration and afterwards a descriptive data analysis was used.

Results: The professionals pointed out weaknesses in the practice, such as double checking of medications, administration of medication prepared by the colleague, delays and lack in checking the prescriptions. The most common errors were derived from the wrong dose and the environmental factors were presented as a critical point.

Conclusion: The findings interfere in the consolidation of safety practices in drug administration in pediatrics and neonatology, suggesting the need for team qualification and continuous monitoring of the work process

Key words: Medication Errors; Safety; Nursing

RESUMO:

Introdução: Prestar um cuidado seguro, efetivo, oportuno e individualizado é um grande desafio na assistência à saúde. Atualmente, os principais erros na assistência à saúde estão relacionados à erros de medicação. Esses erros podem ocasionar danos, especialmente na pediatria, em decorrência da imaturidade dos órgãos e a variação de peso e superfície corpórea. Dessa forma, percebe-se a importância da enfermagem nesse cenário para a garantia de uma assistência segura.

Objetivo: Investigar a prática dos profissionais de enfermagem sobre processo de administração de medicamento, bem como as circunstâncias que levam aos erros.

Método: estudo descritivo, quantitativo, realizado com 147 profissionais de enfermagem em Unidades Intensivas neonatais e pediátricas. Para a coleta de dados foi utilizado um questionário elaborado e alicerçado nas recomendações do *Guideline for Prevention of Intravascular catheter-related infections* com perguntas relativas a prática de administração de medicamentos e posteriormente realizado análise descritiva dos dados.

Resultados: Os profissionais apontaram fragilidades da prática como checagem dupla das medicações, administração de medicações preparada pelo colega, atrasos e falta de checagem das prescrições. Os erros mais comuns derivaram de dose errada e os fatores ambientais foram apresentados como ponto crítico.

Conclusão: os achados encontrados interferem na consolidação de práticas de segurança na administração de medicação na pediatria e neonatologia, sugerindo necessidade da qualificação da equipe e monitoramento contínuo do processo de trabalho.

Palabras clave: Erros de Medicação; Segurança; Enfermagem.

RESUMEN:

Introducción: Prestar un cuidado seguro, efectivo, oportuno e individualizado es un gran desafío en la asistencia a la salud. Actualmente, los principales errores en la asistencia a la salud están relacionados con errores de medicación. Estos errores pueden ocasionar daños, especialmente en pediatría, debido a la inmadurez de los órganos y la variación de peso y superficie corpórea. De esta forma, se percibe la importancia de la enfermería en ese escenario para la garantía de una asistencia segura.

Objetivo: Investigar la práctica de los profesionales de enfermería sobre el proceso de administración de medicamentos, así como las circunstancias que conducen a los errores.

Método: Estudio descriptivo, cuantitativo, realizado con 147 profesionales de enfermería en Unidades Intensivas neonatales y pediátricas. Para la recolección de datos se utilizó un cuestionario elaborado y basado en las recomendaciones de la *Guideline for Prevention of Intravascular catheter-related infections* relacionadas con la práctica de la administración de medicamentos y posteriormente se realizó análisis descriptivo de los datos.

Resultados: Los profesionales señalaron fragilidades de la práctica como chequeo doble de las medicaciones, administración de medicamentos preparados por el compañero, retrasos y falta de verificación de las prescripciones. Los errores más comunes derivaron de dosis erróneas y los factores ambientales fueron presentados como punto crítico.

Conclusión: Los hallazgos encontrados interfieren en la consolidación de prácticas de seguridad en la administración de medicación en pediatría y neonatología, sugiriendo la necesidad de la calificación del equipo y monitoreo continuo del proceso de trabajo

Palavras-chave: Errores de Medicación; Seguridad; Enfermería

INTRODUCTION

One of the major challenges for health services today is to provide safe, effective, timely and individualized care, since that, with technological and scientific advances and the inclusion of increasingly complex techniques, the risks for patient safety have been potentiated.⁽¹⁾

The report *To Err is Human: Building a Safer Health System* Institute of Medicine of the United States of America (USA), published in 2000, displayed epidemiological studies that estimated that from 44,000 to 98,000 annual deaths in the country occurred due to errors in health care, of which 30% were related to medication error.⁽²⁾ In Brazil, the National System of Toxic-Pharmacological Information (Sintox), reveals that drugs are in the first place among the agents causing intoxication in humans and in the second place among the agents causing intoxication.⁽¹⁾ Also in Brazil, an important study carried out in a hospital in Rio de Janeiro showed a 14.3% occurrence of adverse events caused by drugs, 31.2% of which caused a severe health risk requiring life support.⁽³⁾

Medication error is defined as an avoidable adverse event, temporary or permanent, occurring at any stage of the drug therapy and which may or may not cause harm to the patient. Finding the damage is an adverse event, which is considered an incident that results in damage to the patient's health, affecting the recovery, increasing hospitalization time and costs and leading to death. Medication errors can be classified in: error from prescription, distribution, omission, schedule, using non-authorized drugs, dosage, presentation, preparation, administration, monitoring or because of non-adherence on the side of the patient and the family.⁽⁴⁾

Estimates show that among all the hospitalized patients, about 3% develop an adverse event due to the use of some medication. Although the frequency is similar among children and adults, the potential risk of harm is three times higher among pediatric and neonatal patients.^(4,5) The increased risk in children is attributed to the immaturity of the organs which influences the metabolism of the drugs, as well as to the variation in weight and body surface. Associated with this fact, we can add that many drugs used in pediatrics are intended for adults where, as a result of fractioning the doses, they may lead to errors in the preparation and administration process.^(6,7)

Studies have confirmed that errors occurring during drug administration can be avoidable, which evidences the important participation of the nursing team in the system for promoting patient safety.⁽⁶⁾ This fact is even more striking when it comes to pediatric care, since a systematic review about medication errors in children has shown that the medication administration process showed a higher frequency of errors, among others, with a rate of 72 to 75%, and it is therefore a challenge for every health institution and team to promote changes in the organizational culture that allow for the analysis with process restructuring and the creation of safety strategies in order to reduce, to an acceptable minimum, unnecessary risks and damages associated with care.⁽⁸⁾ In the pediatric and neonatal intensive care units, errors range from 22 to 59 errors per thousand doses, and about 2.5% of these children suffer from drug-related adverse events.⁽⁴⁾

In this context, the nursing role is highlighted, since in addition to exercising the leading role in administration and monitoring in drug therapy, the complexity in pediatrics, demands greater knowledge and commitment of the professional in conducting the process. However, in spite of the professional practice law proclaiming that more complex practices be performed by nurses, it has been observed in daily practice that nurses, technicians and nursing assistants have similar attributions in drug therapy.⁽⁵⁾

The lack of quality in this process, with consequent problems and occurrence of adverse events, can be avoided with proactive and preventive management

interventions. Among them, educating the nursing team regarding the knowledge about the drug administration process as an important factor for preventing medication errors is highlighted, with a view to the patient's greater safety.^(4,7)

The first step in preventing health error is to admit that it is possible and, from this, health professionals need to understand the types of adverse events, their causes, consequences and contributing factors. The notification and registration of adverse events serve as elements for critical analysis and decision-making, which aims to eliminate, avoid and reduce these circumstances in daily health care.⁽⁹⁾

To subsidize and improve the practice, it is necessary to know how the practice of the nursing team at the administration of drugs in neonatal and pediatric intensive care units occurs, as well as the circumstances in which the errors occur. This research may offer subsidies to the professionals for an extended analysis of the practice and of the problems that permeate this process and, thus, favor the design of actions that generate a better quality care and safety for all involved.

Thus, this study aims to investigate the practice of nursing professionals in the medication administration process, as well as the circumstances that lead to errors in neonatal and pediatric intensive care units.

METHOD

This is a descriptive-exploratory study, with a quantitative approach, performed with the nursing team of Neonatal and Pediatric Intensive Care Units of a large hospital in Belo Horizonte, Minas Gerais.

Data collect was performed from August to November 2017, in the morning, afternoon or evening shifts, on random days, contemplating six shifts per week. All nurses, technicians and nursing assistants who worked in the respective units were included in the study, resulting in a sample of 147 professionals. The following exclusion criteria were considered: professionals who were on vacation, on medical leave or maternity leave, during the data collect period. A questionnaire was prepared based on the recommendations of the *Guideline for Prevention of Intravascular catheter-related infections*⁽¹⁰⁾ and was submitted to the pre-test with three specialist nurses, who pointed out different suggestions for instrument adjustment.

The instrument was divided in two parts: Part I was related to the characterization of the socio-demographic profile, where variables such as gender, age, actuation time in the sector and the profession, postgraduate training for the nurses, work day and work shift, type of employment contract, participation in courses and lectures on the medication administration process, were approached. In Part II there were 14 questions considering how often actions are taken during the drug administration process. For each action, there were four alternatives: always, sometimes, rarely or never that should be pointed out by the respondent. Regarding the circumstance of errors, 5 questions with varied answers were included, among them questions about the types of errors, circumstances that led to errors, doubts in the medication process, actions regarding errors, and to whom one should turn to for errors.

Data was typed in without spreadsheet in the Microsoft Excel 2010 program, double typing the data. They were analyzed in the StatisticalPackage for the Social Sciences

(SPSS) version 19 software, using descriptive statistics with absolute and relative frequencies for categorical variables and central trend measures (median) and dispersion measures for numerical variables.

The study observed the recommendations for privacy and confidentiality under Resolution No. 466, dated October 12, 2012, National Council of Health for Scientific Research with Human Beings, and was approved by the Ethics and Research Committee of the Federal University of Minas Gerais and the field of study institution with the number of written opinion under 1.363.357 and CAAE: 47994215.9.0000.5129. All research's volunteers were previously oriented about the objectives of the study and, after agreeing, signed the Free and Informed Consent Term (FICT) in two counterparts.

RESULTS

This study's sample was predominantly composed by nursing technicians, aged between 25 and 68 years old (median=39 years old), mostly women, who had between 1 and 40 years of training (median=12), acting predominantly in the Neonatal ICU, in a 12h day/daytime work regime, with a statutory and unique bond.

Of the 24 nurses, two (8.3%) have a master's degree, and 21 (87.5%) have some specialization. Among the professionals with specialization, 12 (57.1%) are related to pediatrics and neonatology, and nine (42.85%) are related to other areas. Data on the profile of the professionals are displayed in Table 1.

Table 1 - Professional profile for the nursing team of neonatal and pediatric ICU units (N = 147). Belo Horizonte, MG, Brazil, 2017.

Profile of the professionals	N	%
Age Median (P25-P75)	39	(34-45)
Time of training Median (P25-P75)	12	(9-18)
Time of performance in the profession Median (P25-P75)	11.5	(8-18)
Total weekly working hours Median (P25-P75)	36	(30-40)
Time of performance in the institution Median (P25-P75)	8	(3-9)
Time of performance in the current unit	8	(1.75-9)

Median (P25-P75)			
Sector of work in the institution	ICU, Neonatal	61	41.5%
	ICU, Pediatrics	43	29.3%
	Pediatric ward	43	29.3%
Gender	Male	6	4.1%
	Female	141	95.9%
Profession	Nursing Assistant	5	3.4%
	Nursing Technician	118	80.3%
	Nurse	24	16.3%
Working hours in the institution	12 hours daytime	75	51.0%
	40 hours per week	1	0.7%
	12 hours at night	55	37.4%
	6 hours daytime	4	2.7%
Currently working	6 hours afternoon	5	3.4%
	Only in this institution	82	55.8%
	In this institution and studying	16	10.9%
	In this institution and elsewhere	43	29.3%
Employment contract	In this institution, studying and working in another institution	5	3.4%
	Statutory	103	70.1%
	Working under the consolidation of Labor Laws	21	14.3%
	Contract	23	15.6%

Of the professionals participating in the research, 51 (34.7%) stated that they had participated in courses or lectures on the medication administration process between October 2016 and October 2017, while 94 (63.9%) stated that they did not participated in courses and lectures during this period.

When asked if the nursing team had already made a mistake in the medication preparation and administration process, 69 (46.9%) of the professionals said yes, while 71 (48.3%) said they did not. Table 2 displays the descriptive analyses for the quantitative variables related to errors in drug preparation and administration.

Table 2- Frequency regarding doubts and circumstances of errors in preparing and administrating drugs. Belo Horizonte, MG, Brazil, 2017.

Circumstances for errors in preparing and administering drugs		N	%
Doubts that lead to the error	Compatibility	87	59.2%
	Scheduling	35	23.8%
	Dilution and diluent	49	33.3%
	Stability	67	45.6%
Who to turn to in case of doubt	Action of drugs	110	74.8%
	Peers	77	52.4%
	Doctor	48	32.7%
	Pharmacist	49	33.3%
	Specialized bibliography	22	15.0%
	Printed routine of the sector	51	34.7%
	On duty nurse	20	13.6%

Types of errors made	Wrong dose	179	61.3%
	Wrong route	53	18.1%
	Wrong patient	6	4.1%
	Wrong medication	6	4.1%
	Wrong diluent	11	7.5%
	Wrong schedule	31	21.1%
Conduct in the face of error	Solve it by yourself	3	2.0%
	Notify nursing coordination	117	79.6%
	Notify doctor on call	65	44.2%
	Notify hospital risk management	4	2.7%
Factors contributing to the error	Insufficient information about the patient	19	12.9%
	Insufficient information about the drug	37	25.2%
	Communication failures among professionals	67	45.6%
	Confusing packaging in drug identification	51	34.7%
	Inappropriate dispensing by the pharmacy	27	18.4%
	Infusion pumps and equipment without calibration	10	6.8%
	Environmental issues: low light, working conditions	86	58.5%

Regarding the professionals' conduct, when there was a delay in the medication schedule, 119 (81.0%) professionals claimed that they administered the medication late, while 2 (1.4%) said they skipped the time and 3 (2.0 %) that they advance the next time of medication. Also, when they detected an error in the medical prescription, 96 (65.3%) responded that they notify the nurse or the nursing coordination, 90 notify the doctor on call (61.2%) and 1 (0.7%) participant claimed trying to solve it by himself/herself. Table 3 displays the analyses regarding the practice of the professionals during drug preparation and administration.

Table 3 - Frequency of the actions performed by the professionals in the drug preparation and administration process. Belo Horizonte, MG, Brazil, 2017.

Actions taken by the professionals		N	%
Interrupted while preparing the drug	Always	54	36.7%
	Few times	54	36.7%
	Rarely	32	21.8%
	Never	6	4.1%
Checks the full name of the patient receiving the drugs	Always	140	95.2%
	Few times	7	4.8%
Checks the dose given with the prescription	Always	143	97.3%
	Few times	1	0.7%
	Rarely	1	0.7%
	Never	1	0.7%
Checks the route of administration with the prescription	Always	142	96.6%
	Few times	2	1.4%
	Never	1	0.7%
Checks and certifies the name of the drugs with the prescription	Always	143	97.3%
	Few times	3	2.0%
	Never	1	0.7%

Checks the medication schedule against the prescription	Always	145	98.6%
	Few times	1	0.7%
	Never	1	0.7%
Labels refrigerator medications with date/time/dilution	Always	143	97.3%
	Few times	1	0.7%
	Rarely	2	1.4%
	Never	1	0.7%
Checks the stabilization time of the drugs administered continuously in the patient	Always	128	87.1%
	Few times	16	10.9%
	Rarely	1	0.7%
Checks the dripping on the infusion pump according to the prescription	Always	138	93.9%
	Few times	8	5.4%
Checks the expiration date of the drugs before preparation and administration	Always	113	76.9%
	Few times	21	14.3%
	Rarely	5	3.4%
	Never	6	4.1%
Checks on the prescription just after the drug has been given	Always	127	86.4%
	Few times	15	10.2%
	Rarely	2	1.4%
	Never	2	1.4%
Gives medication prepared by another professional	Always	35	23.8%
	Few times	40	27.2%
	Rarely	42	28.6%
	Never	25	17.0%
Labels collective use drugs	Always	109	74.1%
	Few times	12	8.2%
	Rarely	7	4.8%
	Never	17	11.6%
Checks the drugs on the prescription before being given	Always	19	12.9%
	Few times	27	18.4%
	Rarely	25	17.0%
	Never	72	49.0%

DISCUSSION

The preparation and administration of drugs is a complex process where nursing professionals have an important role as the last barrier to prevent possible drug-related harm to the patient. Thus, this study sought to elucidate that, through the analysis of the practice and circumstances of errors, it is possible to propose more effective strategies for promoting safety culture for the patient, providing a more qualified and effective care.

Due to the uniqueness and complexity of the therapy directed to neonatology and pediatrics, it is extremely important to deepen specific knowledge and frequent

trainings in such themes.⁽⁵⁾ Contrary to this recommendation, this study warned that 63.9% of the subjects in the study stated that they did not participate in courses and lectures on drug preparation and administration in the last year and that the majority has doubts regarding the drug action that are resolved with their colleagues and not with the referral nurse. It is therefore suggested that, for a good quality and safe care, it is necessary that the work processes be reviewed based on scientific evidence and that the professionals be trained and qualified, incorporating leaders and those led. Educational strategies, mediated by focus groups or educational websites and simulation games, have been shown to be important interventions to reduce incident rates involving drugs.^(11,12)

The main medication error raised by the study professionals was dose-related error, corroborating a study conducted in the United States with 120 patients, which showed that half of the patients were exposed to medication errors, and most were related with the dose. It should be noted that the main factor contributing to the dose error in this study is the complexity and specificity of drug therapy in neonatology and pediatrics.^(9,13) The literature shows a high prevalence of errors in the medical prescription, being more prevalent in drugs that require weight-based dosing and, therefore, making it necessary to elaborate a specific prescription instrument for pediatrics and neonatology, besides influencing the concordance of the actions taken when errors have been detected.⁽¹⁴⁾

Regarding the reasons contributing to the medication error, the environmental factors among them, low lighting and adequate physical conditions constituted the largest percentage of the sample, followed by communication failures, corroborating with other studies.⁽¹⁵⁻¹⁶⁾ It is verified that medication errors are due to the lack of preparation and knowledge of the professionals, the overload and stress generated in the work environment and the failure in the multidisciplinary team communication. Furthermore, it is emphasized that it is common that drugs are suspended and that the doctor who suspended did not communicate it to the nursing team.⁽¹⁵⁾ The Food and Drug Administration (FDA) evaluated reports on fatal drug errors and identified that 16% of the causes for such errors were attributed to communication failure. Therefore, prescription is an important written communication link among health professionals, seen as the beginning of a series of events within the medication process, which will result in the safe administration of a dose to the patient.⁽¹⁷⁾

Effective communication is another important factor in promoting patient safety in drug administration, permeating all interpersonal relationships, and it is directly linked as a cause or contributing factor to most of the incidents. An adequate communication between professionals and patients/caregivers regarding the administration of the drugs brought relevant and effective results, thus avoiding the occurrence of new incidents.⁽¹⁸⁾

Regarding error occurrence, it is important to note that, from the error recognition, it is necessary to analyze the whole process and the components of the medication system, which may contribute or act as a barrier to the outcome of the error. These factors can be attributed to the professionals, to failures in the system, to the institution or even to the presentation of drugs. This analysis is indispensable for understanding all factors that involve the medication process, not attributing failures to the incompetence or irresponsibility of the employees.⁽¹⁹⁾

Regarding the professional's behavior given the error, most of the interviewees stated that they notify the nursing coordination, diverging from other studies. A South Florida survey found that 57.9 percent would not report an error if they did not think it was dangerous and 25 percent would not report it for fearing the consequence. The perception of nursing on medication errors is that only 45.6% are notified, the rest is omitted for fearing the leadership and colleagues.⁽¹⁹⁾ The treatment given to error notifications with a focus on the professional's performance contributes to the underreporting of mistakes, since that professionals are afraid to respond to legal and administrative processes, being labeled as negligent, lose the trust of the manager and of their team. This is a worrying fact that must be reversed, since underreporting impedes error analysis and the elaboration of possible measures that minimize their occurrence and ensure patient's safety.

Studies that problematize cultural change in approaching patient's safety incidents have demonstrated that an intervention specifically focused on this subject for the practitioners significantly reduces medication errors. In addition, a political change is needed in the institutions.⁽¹⁸⁾

A major problem identified by the participants in this research was the interruption in drug preparation, which is included in the research as a critical point that leaves professionals more vulnerable to commit an error, because they are exposed to distractions. A research performed with pediatric nurses showed that in 88.9% of the observed interruptions, the outcome was negative. Thus, a study suggests the need to create restricted areas for preparing drugs, thus preventing interferences.⁽²⁰⁾

Double checking is an effective method for suppressing errors in drug administration.⁽¹⁵⁻¹⁶⁾ In this study, the nursing team reported that this practice is scarcely or rarely performed. In addition, there was administration of drugs by another person and lack in conference of drugs with the prescription before being administered, which contravenes the recommendations of good practices regarding drug administration.⁽¹⁰⁾

In this study, professionals reported that they adhere to some recommended actions in the safe process of drug administration. However, it should be considered that all practices that involve patient's safety in the care process must be fulfilled, and not just some. Ensuring compliance with the good practices prevents the breaking down of barriers for preventing injuries.^(10,16)

The submitted results are directly related to the institutional specificities, a fact that limits generalization. Thus, the relevance of studies with representative samples, with the same theme as in this study, is highlighted, resulting from the scarcity of studies with such design and approach in pediatrics and neonatology.

CONCLUSIONS

The study showed that the practice in drug preparation and administration has important fragilities that may compromise the safety of the pediatric patient. Thus, the need for the team to reflect on the findings so that behavioral changes and safe strategies may take place in order to prevent errors and consequently for the benefit of patient safety is pointed out.

In view of the above said, the relevance of such results is notorious. In this perspective, the team's continuing qualification with emphasis on the specifics of pediatrics and neonatology and monitoring and evaluating process indicators are important strategies for preventing errors and adverse events. It is believed that through these actions the development and implementation of the safety culture are made possible.

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