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Characterization of drug prescriptions in an adult intensive care unit

Caracterização das prescrições medicamentosas em unidade de terapia intensiva adulto

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This study was conducted at the adult intensive care unit, Núcleo Hospital Universitário Maria Aparecida Pedrossian, Fundação Universidade Federal de Mato Grosso do Sul - UFMS - Campo Grande (MS), Brazil.

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ABSTRACT

Objective: To characterize drug prescriptions in a university hospital adult intensive care unit.

Methods: Single-center, observational, descriptive, cross-sectional study conducted at an adult general intensive care unit. The study population included all of the unit's inpatients from January to March 2011. The following characteristics for all prescriptions recorded during this period were examined: drug name (generic, brand name or abbreviation), dosage strength, pharmaceutical form, dose, route of administration, patient name, patient registration in the institution, clinic and hospital bed as well as the name, board license number, signature of the prescriber and date of the prescription. It was quantified the percentage of prescribed drugs included in the National List of Essential Drugs, the World Health Organization Model List of Essential Medicines and the University Hospital Center Pharmacotherapy Guide. The prescribed drugs were classified based on the Anatomical Therapeutic Chemical classification system (levels 1 and 2).

Results: Eight hundred forty-four prescriptions were reviewed from 72

patients (mean age: 59.04 ± 21.80), 54.92% of whom were female. The mean number of prescriptions per patient was 11.72 ± 11.68 . The total number of drugs prescribed was 12,052 and 9,571 (79.41%) of the drugs were prescribed using the generic name. The most frequent absent information in the drug description was the pharmaceutical form of the drug (8,829/73.26%). The dosage strength was indicated in 7,231 (60%) of the prescriptions, and the prescriber and patient information were indicated in over 96% of the prescriptions. The prescribed drugs were classified in 13 therapeutic groups and 55 subgroups. Systemic antibacterials represented one of the most frequently prescribed subgroups.

Conclusion: Most of the reviewed information was present in the prescriptions. However, the dosage strength and pharmaceutical form were absent in many prescriptions. The characterization of prescriptions at different hospital units is essential for the development of strategies that reduce drug utilization problems.

Keywords: Intensive care; Medication errors; Inpatients; Drug prescriptions; Drug utilization

INTRODUCTION

The analysis of drug prescriptions is one potential source of information to studies concerning drug utilization and its consequences once it is the first step of the chain of drug utilization. Additionally, drug prescriptions represent an important communication link between the professionals involved in patient care.⁽¹⁾

Prescriptions must contain data that identify the patient and the prescriber as well as provide a detailed description of the drug, to ensure the proper quality to the assistance.⁽²⁾ These information are considered essential, and when part of it is absent, incomplete or illegible, the likelihood of drug dispensing and administration errors is increased.⁽³⁾

Errors may also occur during drug selection, and the World Health Organization (WHO) has proposed measures to regulate the selection of drugs, recommending the prescription in accordance with the List of Essential Medicines.⁽⁴⁾ In Brazil, the National List of Essential Drugs (Relação Nacional de Medicamentos Essenciais - RENAME) is used to rationalize the actions of healthcare and the actions of management. In hospitals, the development and dissemination of the Pharmacotherapy Guide, based on RENAME list corroborates to the rational drug utilization.⁽⁵⁾

The intensive care unit (ICU) is the hospital department characterized by the complexity care of patients in critical conditions. The clinical condition of this population frequently requires the use of many drugs which generates long prescriptions and an increased risk for adverse event development. The optimization of drug use increases quality and safety and reduces costs, rationalizing intensive care service.^(6,7) Thus, this study aimed to characterize the drug prescriptions in the adult ICU of the Núcleo Hospital Universitário - NHU, Maria Aparecida Pedrossian, Universidade Federal de Mato Grosso do Sul - UFMS, MS, Brazil.

METHODS

A single-center, observational, descriptive, cross-sectional study was conducted in the adult ICU at NHU Maria Aparecida Pedrossian, Fundação Universidade Federal de Mato Grosso do Sul (UFMS) in Campo Grande, (MS), Brazil. The NHU is a tertiary level teaching hospital with a 280-bed capacity. NHU is part of the Brazilian unified health system (Sistema Único de Saúde - SUS). The NHU adult ICU is a general ICU and has eight beds. The occupancy rate of this ICU is 94%, and 300 prescriptions on average are written per month. The prescriptions from the adult ICU are typed or handwritten (non-computerized system) by preceptor physicians, assistants, physicians on duty and residents. The drug delivery system in the hospital is individualized, and the drugs are dispensed for 24 hours, with the exception of cytostatic drugs which are dispensed in a unit dose system.

The study was conducted using the duplicate of all the prescriptions of adult ICU inpatients in the period from January to March 2011. To collect and analyze the content of prescriptions, it was designed a form to obtain the

following information: drug name (generic, brand name or abbreviation), dosage strength, pharmaceutical form, dose, route of administration, patient name and registration in the institution, clinic and hospital bed as well as the prescriber name, board license number, signature and date of prescription. The Brazilian common denomination list (Denominação Comum Brasileira; DCB) or, in its absence, the International Nonproprietary Name (INN) were used to evaluate whether drugs were prescribed by the generic name.

It was also verified the percentage of prescribed drugs that belonged to the 7th edition of RENAME, the 16th WHO Model List of Essential Medicines or the NHU Pharmacotherapeutic Guide. The drugs were classified using the Anatomical Therapeutic Chemical (ATC) classification system (2011 Index, levels 1 and 2).

The data were stored in Excel spreadsheets, version 7.0, and statistical analyzes were performed using Epi-Info 3.5.1. The results were presented in the tables as the mean \pm standard deviation, minimum and maximum values and the absolute and relative frequency. The project was approved by the Research Ethics Committee of the UFMS under protocol number 1.962/2011 and by the Hospital Board of Directors and informed consent was waived.

RESULTS

Eight hundred forty four prescriptions from 72 patients were analyzed, from which 685 (81.16%) were typed prescriptions and 159 (18.83%) were handwritten. The mean age of the patients was 59.04 ± 21.80 years (minimum of 13 and maximum of 95 years of age). Three patients were between months and 18 years old (4.35%), 26 patients were between 19 and 59 years old (37.68%) and 40 patients were between 60 and 95 years old (57.97%). Three prescriptions had no information concerning the patient's age. Of the total patients, 39 (54.92%) were female and one patient's sex was not reported. The average number of prescriptions per patient was 11.72 ± 11.68 (range 1 to 51). The total number of prescribed drugs was 12,052, average of 14.28 ± 6.31 drugs per prescription (range 1 to 28). It was verified that 1,603 (13.30%) drugs were prescribed using abbreviation, 2,481 (20.59%) were prescribed by the brand name and 9,571 (79.41%) were prescribed by the generic name. The date was indicated in 12,036 (98.10%) prescriptions.

The data related to drug pharmaceutical form, dosage strength, dose and route of administration as well as data related to the patient and prescriber are shown in table 1.

Most of the drugs (11,994; 99.52%) were part of the hospital Pharmacotherapeutic Guide, 9,109 (75.58%) were

included in the RENAME list, and 5,861 (48.63%) were included in the WHO List of Essential Medicines.

The prescribed drugs were classified into 13 therapeutic groups and 55 subgroups, according to the ATC classification system. The most prescribed subgroups were

Table 1 - Information related to patient, prescriber and drug included in prescriptions

Information	N	%
Patient	844	100
Name	843	99.88
Hospital registration	831	98.46
Clinic	830	98.34
Hospital bed	818	96.92
Prescriber	844	100
Name	840	99.53
Board license number	840	99.53
Signature	839	99.40
Drug	12,052	100
Dose	11,912	98.84
Route of administration	11,774	97.70
Dosage strength	7,231	60.00
Pharmaceutical form	3,223	26.74

Table 2 – Drugs prescribed at the adult intensive care unit (frequency > 1%) and classified according to the Anatomical Therapeutic Chemical levels 1 and 2 (N = 12,052)

ATC	Therapeutic groups	N	%
A	Alimentary tract and metabolism		
A.02	Drugs for acid-related disorders	663	5.50
A.03	Drugs for functional gastrointestinal disorders	681	5.65
A.10	Drugs used in diabetes	695	5.77
A.12	Mineral supplements	359	2.98
B	Blood and blood-forming organs		
B.01	Antithrombotic agents	575	4.77
B.05	Blood substitutes and perfusion solutions	678	5.63
C	Cardiovascular system		
C.01	Cardiac therapy	500	4.15
C.03	Diuretics	331	2.75
C.08	Calcium channel blockers	136	1.13
C.09	Agents acting on the rennin-angiotensin system	251	2.08
H	Systemic hormonal preparations, excluding sex hormones and insulin		
H.02	Corticosteroids for systemic use	366	3.04
J	Antiinfectives for systemic use		
J.01	Antibacterials for systemic use	1,313	10.90
J.02	Antimycotics for systemic use	305	2.53
N	Nervous system		
N.01	Anesthetics	564	4.68
N.02	Analgesics	895	7.43
N.05	Psycholeptics	264	2.19
R	Respiratory system		
R.03	Drugs for obstructive airway diseases	1,251	10.38
R.05	Cough and cold preparations	130	1.08
V	Various		
V.06	General nutrients	653	5.42

antibacterials for systemic use, drugs for obstructive airway diseases and analgesics (Table 2). Antibacterials for systemic use, carbapenems, glycopeptides and polymyxins were the most frequently prescribed medicines (Table 3).

Table 3 – Antibacterials prescribed at the adult intensive care unit and classified according to the Anatomical Therapeutic Chemical classification system up to level 3 (N=1,313)

ATC	Pharmacological classes	N	%
J.01.DH	Carbapenems	330	25.13
J.01.XA	Glycopeptide antibacterials	250	19.04
J.01.XB	Polymyxins	159	12.11
J.01.DD	Third-generation cephalosporins	121	9.22
J.01.FA	Macrolides	88	6.70
J.01.GB	Aminoglycosides	65	4.95
J.01.EE	Sulfonamides and trimethoprim	62	4.72
J.01.FF	Lincosamides	62	4.72
J.01.XD	Imidazole derivatives	48	3.66
J.01.MA	Fluoroquinolones	43	3.27
J.01.DE	Fourth-generation cephalosporins	27	2.06
J.01.XX	Oxazolidinones	23	1.75
J.01.CE	Beta-lactamase-sensitive penicillins	18	1.37
J.01.CR	Penicillins and beta-lactamase inhibitors	12	0.91
J.01.CF	Beta-lactamase-resistant penicillins	4	0.30
J.01.DB	First-generation cephalosporins	1	0.08

DISCUSSION

In this study, approximately 80% of prescriptions included the use of the generic name. Aguiar et al.⁽⁸⁾ and Toffoli-Kadri et al.⁽⁹⁾ observed a smaller number of drugs prescribed using the generic name in public and private hospitals, respectively. However, these authors reviewed general hospital data and did not focus on a specific unit, such as the ICU.

In Brazil, the Law number 9.787/99⁽¹⁰⁾ establishes that the prescription of drugs in health services linked to the public sector must be done following the DCB. The results indicate that most of the prescribers are aware of this requirement. Non-adherence to prescription by the generic name can be attributed to the influence of pharmaceutical industry marketing on prescribers, which causes concern when considering that the study was conducted in a teaching hospital. In addition, the availability of different commercial formulations for the same active ingredient, the ignorance of the law and the high number of associations and reliability of certain pharmaceutical brands are factors that could lead a physician to prescribe medications by their brand names.⁽¹¹⁾

The average number of drugs per prescription was higher than the number observed in other Brazilian studies conducted in ICU.^(7,12) The number of drugs per

prescription is a risk indicator once the occurrence of drug interactions and adverse effects is directly proportional to the number of prescribed drugs.⁽¹³⁾

This study observed a lower percentage of abbreviations compared with Rosa et al.,⁽³⁾ most likely because only abbreviations of drug names were evaluated. The use of abbreviations is among the major causes of errors related to drug utilization because they create confusion at the time of drug dispensing and administration. The practice of using abbreviations in prescriptions is therefore discouraged by organizations such as the American Society of Health-System Pharmacists and the National Coordinating Council for Medication Error Reporting and Prevention, among others.⁽¹⁴⁾

The description of the pharmaceutical form was present in approximately 27% of prescriptions. A similar result was reported by Lisby et al.⁽¹⁵⁾ in a study conducted in a hospital in Denmark. Cruciol-Souza et al.⁽¹⁾ reviewed prescriptions in a university hospital in Londrina (PR), Brazil, and also noted that the pharmaceutical form was the most frequently missing information in drug prescriptions.

The dosage strength was present in more than 50% of prescriptions. This observed value is similar to that observed in another study conducted in a hospital environment, where the dosage strength was missing in 49.8%, unclear in 5.6% and incomplete in 4.4% of prescriptions.⁽³⁾ It is noteworthy that both the pharmaceutical form and the dosage strength are essential information for dispensing and administration of medicines, even if only a single pharmaceutical form or dosage strength is standardized at the hospital.

The description of the route of administration were present in most of the collected prescriptions. Silva et al.⁽¹⁶⁾ identified prescriptions lacking information regarding the route of administration.

The patient identification, including the patient's name and hospital bed, was present in 95% of prescriptions. These items are crucial to patient safety, as the lack of this information favors drug administration to the wrong patient or difficult the calculations of patient expenses during hospitalization.⁽¹⁾

The identification of the prescriber is also essential in a prescription. In this study, the professional board license number and the signature of the prescriber were observed in most of the prescriptions. Rosa et al.⁽³⁾ observed problems in the identification of the prescriber and in the professional board license in almost 34% of the analyzed prescriptions. Aguiar et al.⁽⁸⁾ noted the absence of information about the prescriber in up to

87% of the prescriptions at a general public hospital of medium size. These items are a legal requirement and are extremely useful for the clarification of the prescription, its validity and patient safety.

In this study, it was observed that approximately 76% of the prescribed drugs were part of the RENAME list, half of the total were listed in the WHO Model List of Essential Medicines and nearly all of the prescribed drugs were part of the Pharmacotherapeutic Guide of the hospital. In a similar study conducted in a general hospital, Toffoli-Kadri et al.⁽⁹⁾ found a smaller number of prescribed drugs listed in RENAME which can be explained by the fact that the hospital did not have a list of standard drugs. The frequency of prescribed medicines available in the WHO List of Essential Medicines was similar to the frequency reported by Biswal et al.⁽⁶⁾ in a study conducted in a similar environment in India. Other studies have analyzed the use of medications in ICU⁽¹⁷⁻¹⁹⁾, but they did not report the correlation with lists of essential drugs. The use of an essential drug list selected by strongly grounded evidences is part of the recommendations to improve the use of medicines in developing countries.⁽²⁰⁾

The high percentage of drugs prescribed according to the Hospital Pharmacotherapeutic Guide indicates that there is an adequate standardization of drugs in the institution and good adherence of prescribers to the available therapeutic arsenal.

With respect to the most commonly used subgroups, the results confirm the findings of a study conducted at a general ICU in Nepal, in which antibacterials and medicines for obstructive airway diseases were the most frequently prescribed.⁽¹⁹⁾ In a study performed at a general ICU in Recife (Pernambuco, Brazil), antibacterials were also the most widely used therapeutic class, followed by antihypertensives/antiarrhythmics, antacids, anxiolytics/sedatives/hypnotics and analgesics/antipyretics.⁽¹⁷⁾

The therapeutic classes most commonly used among antibacterials differed from the results of Santos et al.⁽²¹⁾ in a study conducted in three ICU in Brasilia (Federal District, Brazil) once, in Campo Grande (Mato Grosso do Sul, Brazil), it was observed a higher frequency of prescriptions of antibacterials to resistant microorganisms, such as carbapenems, glycopeptides and polymyxins.

The frequent use of antibacterials in ICU is due to elevated rates of infections, which are five to ten times higher in ICU than in the other hospital units as a result of the patients' serious conditions.⁽²²⁾

Regarding the frequent use of drugs for obstructive

airway diseases, it can be explained by the fact that respiratory diseases, such as chronic obstructive pulmonary disease (COPD) and pneumonia, are frequent causes of hospitalization in ICU.⁽²³⁾

ICU inpatients usually undergo painful procedures, so the use of analgesics to provide comfort to inpatients is a priority in intensive care.⁽²⁴⁾

The number of items per patient without repetition of the drug were not included in this study. This fact does not allow the identification of the most common prescription error.

CONCLUSION

The results of this study indicate that the standardization of drugs is suitable for the characteristics of the population attended at the NHU but, considering that this a public hospital, prescription by brand name should not be observed. Although most of the information under review was included in the prescriptions, information concerning the dosage strength and pharmaceutical form of the drugs to be administered was absent in many prescriptions. Measures for preventing errors in prescriptions should be developed in an attempt to eliminate these risk factors for patient health.

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RESUMO

Objetivo: Caracterizar as prescrições medicamentosas em unidade de terapia intensiva adulto em hospital universitário.

Métodos: Estudo unicêntrico, observacional, descritivo, transversal realizado em unidade de terapia intensiva adulto geral. A população foi constituída por todos os pacientes internados na unidade no período de janeiro a março de 2011. Foi verificada a presença dos seguintes itens na prescrição: nome do medicamento (genérico, comercial ou abreviatura), concentração, forma farmacêutica, posologia, via de administração, nome e registro do paciente na instituição, clínica e leito de internação, nome, número do conselho e assinatura do prescritor e data. Quantificou-se a porcentagem de medicamentos prescritos pertencentes à Relação Nacional de Medicamentos Essenciais, Lista de Medicamentos Essenciais da Organização Mundial da Saúde e Guia Farmacoterapêutico do Núcleo Hospital Universitário. Os medicamentos foram classificados com base no sistema *Anatomical Therapeutic Chemical* níveis 1 e 2.

Resultados: Foram analisadas 844 prescrições de 72 pacientes com média de idade de 59,04 ± 21,80, sendo 54,92% do gênero feminino. O número médio de prescrições por paciente foi 11,72 ± 11,68. O total de medicamentos prescritos foi de 12.052. Destes, 9.571 (79,41%) foram prescritos pela denominação genérica. A forma farmacêutica foi a informação mais ausente na descrição dos medicamentos (8.829/73,26%). A concentração dos medicamentos foi descrita para 7.231 (60%) dos medicamentos. As informações sobre o prescritor e paciente estiveram presentes em mais de 96% das prescrições. Os medicamentos prescritos foram classificados em 13 grupos terapêuticos e 55 subgrupos. Entre os subgrupos mais prescritos, destacaram-se os antibacterianos de uso sistêmico.

Conclusão: A maioria das informações analisadas esteve presente nas prescrições. Porém, dados sobre concentração e forma farmacêutica dos fármacos faltaram em grande parte das prescrições. A caracterização das mesmas nas diferentes unidades hospitalares é imprescindível para a elaboração de estratégias que visem minimizar os problemas relacionados ao uso de medicamentos.

Descritores: Cuidados intensivos; Erros de medicação; Pacientes internados; Prescrições de medicamentos; Uso de medicamentos

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