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Pharmacist recommendations in an intensive care unit: three-year clinical activities

Recomendações farmacêuticas em unidade de terapia intensiva: três anos de atividades clínicas

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ABSTRACT

Objective: To analyze the clinical activities performed and the accepted pharmacist recommendations made by a pharmacist as a part of his/her daily routine in an adult clinical intensive care unit over a period of three years.

Methods: A cross-sectional, descriptive, and exploratory study was conducted at a tertiary university hospital from June 2010 to May 2013, in which pharmacist recommendations were categorized and analyzed.

Results: A total of 834 pharmacist recommendations (278 per year, on average) were analyzed and distributed across 21 categories. The recommendations were mainly made to physicians (n = 699; 83.8%) and concerned management of dilutions (n = 120; 14.4%), dose adjustment (n = 100; 12.0%), and adverse drug reactions (n = 91; 10.9%). A comparison per period demonstrated an increase in pharmacist recommendations with larger clinical content and a reduction of recommendations related to logistic aspects, such as drug supply, over time. The recommendations concerned 948 medications, particularly including systemic anti-infectious agents.

Conclusion: The role that the pharmacist played in the intensive care unit of the institution where the study was performed evolved, shifting from reactive actions related to logistic aspects to effective clinical participation with the multi-professional staff (proactive actions).

Keywords: Pharmaceutical care; Pharmacy service, hospital; Pharmacists; Intensive care units

INTRODUCTION

The use of medication by seriously ill patients represents an example of the complex nature of the care provided in the intensive care unit (ICU). The reason for this complexity is that patients are usually subjected to polymedication, which makes pharmacological treatment a significant risk factor for the occurrence of adverse events that might negatively interfere with the clinical progression of patients.[1,2]

According to the Society of Critical Care Medicine (SCCM), as a function of the complex nature of the care provided in the ICU, the ideal method to provide support to the critically ill involves the participation of a multi-professional staff.[3] The SCCM further considers clinical pharmacists as an essential component of such staff who contribute to the excellence of the care provided; therefore, they recommend the inclusion of exclusively dedicated pharmacists in multi-professional staff.[4] In Brazil, pharmaceutical care in the ICU is considered in the current legislation.[5]

Conflicts of interest: None.

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Pharmacists have been incorporated into ICU multi-professional staff to improve the care provided to patients, particularly by monitoring the drugs administered and assessing their efficacy, thus contributing to improving patient safety.[6] The participation of clinical pharmacists in routine ICU care mainly includes active involvement in daily rounds, where they provide relevant information to the medical and nursing staff, analysis and monitoring of the efficacy of pharmacological treatments, implementation of medication reconciliation, and prevention, identification, and reporting of adverse reactions.[7-9] The actions performed by clinical pharmacists relative to the monitoring of pharmacological treatment are referred to as pharmacist interventions or recommendations (PhRs).[6,10] Such professional interventions presuppose actions targeting pharmacological treatment to correct or prevent negative clinical outcomes derived from the use of medications. These are planned and documented actions performed with users and healthcare professionals, as they are a part of the process of monitoring/follow-up of pharmacological treatments.[11]

Although there are considerable reports in the international literature related to the participation of clinical pharmacists in the care provided to patients admitted to the ICU,[7,12-14] similar studies are still developing in Brazil.[15,16] Therefore, studies describing the activities performed by pharmacists in Brazilian ICUs are necessary to characterize how this practice actually unfolds in the country and to allow for assessment of its impact on the ICU staff and patient safety.[16]

The aim of the present study was to quantify, categorize, and analyze accepted PhRs made in the course of the clinical activities of pharmacists in the ICU over a period of three years.

METHODS

The present cross-sectional, descriptive, and exploratory study analyzed the records of the clinical pharmacy unit at a tertiary university hospital with respect to accepted PhRs made in the course of the routine clinical activities of a resident pharmacist in the ICU with in-person supervision from June 2010 to May 2013. The study was approved by the Research Ethics Committee of *Hospital Universitário Walter Cantídio*, ruling no. 607,419; the need for informed consent was waived, and authorization was requested from the ICU coordination and the Pharmacy Division only.

The participation of pharmacists in the daily clinical routine in the ICU during 12-hour daily shifts was consolidated beginning in 2010 when a residence program in the intensive care pharmacy was initiated at the clinical ICU of the hospital where the present study was conducted. The presence of this type of professional allowed broadening the scope of and systematizing actions; the PhRs made to the multi-professional staff were formally recorded.

The adult clinical ICU where the PhRs were made comprises six beds. Overall, the hospital tends to treat high-complexity patients, including cases of kidney, liver, and bone marrow transplantation. The multi-professional staff includes one physician on duty, two attending physicians with a degree in intensive care medicine, two nurses, one physical therapist, one pharmacist, one psychologist, one nutritionist, and four nursing technicians per 12-hour shift. In addition, theoretical-practical training activities are performed every day within the context of medical (internal and intensive care medicine) and multi-professional residency programs in intensive care for pharmacists, nurses, and physical therapists. The staff further includes two medical, two pharmacy, two nursing, and two physical therapy residents. An average of 248 patients/year were admitted to the ICU during the study period, with an average length of stay of 6.7 days. The analyzed PhRs were collected from the pharmacy records available in the Accepted Pharmacist Recommendation Record Form routinely used by the clinical pharmacist at the institution's ICU. The system for drug distribution in the hospital where the study was conducted consisted of a 24-hour supply of doses per patient. Prescriptions were handwritten in duplicate; electronic systems for prescriptions and medical records were not available.

The collected data were entered in a database (BDUTI) that was modified ad hoc using Microsoft Office Excel® 2007 software. The following variables were analyzed relative to the accepted PhRs: period, type of professional addressed, type of medication according to the Anatomical Therapeutic Chemical Code/World Health Organization (ATC/WHO),[17] and classification of the PhR. Annual data such as number of patients/ICU and prescriptions/ICU were also recorded. The percentage of accepted PhRs was calculated based on the number of prescriptions made per year.

Relative to a variable period, the PhRs were categorized as follows: first period if the date entered in the form fell within the interval from June 2010 to May 2011; second period, from June 2011 to May 2012; and third period, from June 2012 to May 2013. The PhRs recorded in BDUTI were categorized based on the standard nomenclature adopted at the Clinical Pharmacy Service of *Hospital Universitário Walter Cantídio* as follows: adequacy of antimicrobial protocol; schedule adjustment;

drug supply; management of medication administered via feeding tubes; management of drug infusion duration; management of dilutions; dose adjustment; interval adjustment; treatment discontinuation; treatment substitution; management of drug administration; management of drug-food interactions; management of drug-drug interactions; changes in the administration route; management of adverse drug reactions; management of the length of treatment; adequacy of managerial protocols for the purchase of drug and healthcare products; information on drug handling/preparation; management of drug stability; pharmacological treatment; and other.

RESULTS

A total of 743 patients were admitted to the ICU from June 2010 to May 2013, corresponding to 4,585 prescriptions and 834 recorded PhRs; therefore, 18.9% of the prescriptions received PhRs. The average number of accepted PhRs was 278 per year, corresponding to 21 different categories. The proportions of PhRs per prescription were 14.5% (n = 230/1,590), 21.1% (n = 269/1,274) and 19.5% (n = 335/1,721) in the first, second, and third periods, respectively. In a global analysis of the full study period, i.e., from June 2010 to May 2013, PhRs relative to management of dilutions (n = 120; 14.4%), dose adjustment (n = 100; 12.0%), management of adverse drug reactions (n = 91; 10.0%), drug supply (n = 82; 9.8%), and management of drug-drug interactions (n = 69; 8.2%) combined represented more than half (n = 462; 55.4%) of the total PhRs (Table 1).

In an analysis per period, management, dilution, and drug supply were among the five most frequent types of PhRs made during all three periods (Table 2). An analysis per period of the progression of four categories of PhRs with high impact on pharmacological strategy, and thus consequently also on clinical strategy, demonstrated a considerable increase in the percentage of PhRs relative to dose adjustment (92.2%), treatment discontinuation (126%), and therapy recommendations (221.5) and a reduction of PhRs for treatment substitution (54.2%) from the first to the last period (Figure 1). An analysis of the progression of the PhRs relative to logistic issues, such as drug supply, showed that their proportion decreased by 3.3% from the first to the last period.

The PhRs concerned a total of 948 drugs, corresponding to 142 different active principles, during the study period. Systemic anti-infectious agents were the main type of drugs targeted in PhRs (n = 440; 52.7%), followed by medications for the digestive system and metabolism (n = 103; 12.4%), agents for the cardiovascular system (n = 100; 11.9%), and drugs for the nervous system (n = 84; 10.0%). The main drugs addressed in PhRs included teicoplanin (n = 100; 11.9%), meropenem (n = 61; 7.3%), omeprazole (n = 51; 6.1%), polymyxin B (n = 47; 5.6%), and piperacillin/tazobactam (n = 35; 4.2%).

From the total of PhRs made and accepted during the study period (n = 834), 83.8% (n = 699) were addressed to physicians (n = 699), 10.3% (n= 86) were addressed to pharmacists, and 5.9% (n= 49) were addressed to nurses. The types of recommendations varied as a function of the professional category (Table 3).

DISCUSSION

In the present study, PhRs were made for 18.8% of prescriptions, and the most common categories were PhRs related to the management of dilutions, dose adjustment, and adverse drug reactions; this observed percentage was close to the value found in the randomized study by Claus et al.[6] at a surgical ICU in Belgium (21.2%) and that found in a study by Reis et al.[16] (14.5%) at the ICU of a Brazilian public teaching hospital.

An analysis per period showed that the percentage of PhRs performed in the first period was the same as that in the previously mentioned study conducted at a Brazilian ICU (14.5%),[16] and the percentage corresponding to the third period was similar to the value reported in the Belgian ICU (21.1%).[6] This variation in the results per period might have been influenced by the population of patients, who mostly exhibited clinical problems and were provided care by professionals involved in teaching activities.

Concerning the typology of PhRs, the literature includes a wide variety of classifications, which indicates the need to standardize the terminology, which will facilitate comparing the results of studies.[7,18-20]

A comparison of our results relative to those available in the literature showed that other studies have also reported PhRs relative to dose adjustment and the management of adverse events and interactions.[10,15] While in the present study the most prevalent PhRs concerned the management of dilutions, this was not the case in other studies conducted in Brazilian institutions.[15,16] This difference might be due to the type of pharmaceutical analysis that is performed in the case of intravenous mixtures; in the present study, not only the drug stability but also the patient's water balance was taken into consideration. PhRs relative to logistic aspects, such as drug supply, which in the presented study corresponded to 9.8% of the total of recommendations, were not reported by other authors.[6,15,16] The recommendations regarding drug supply aimed to ensure access to prescribed medications

Table 1 - Classification of pharmacist recommendations made at the clinical intensive care unit of a federal university hospital from June 2010 to May 2013

Categories of pharmacist recommendations	1st period (N = 230)	2nd period (N = 269)	3rd period (N = 335)
	N (%)	N (%)	N (%)
Management of dilutions	25 (10.8)	33 (12.2)	62 (18.5)
Dose adjustment	20 (8.7)	24 (8.9)	56 (16.7)
Management of adverse drug reactions	29 (12.6)	37 (13.7)	25 (7.4)
Drug supply	29 (12.6)	25 (9.2)	28 (8.3)
Management of drug-drug interactions	2 (0.8)	38 (14.1)	29 (8.6)
Management of drug administration per tube	12 (5.2)	21 (7.8)	20 (5.9)
Management of drug infusion duration	20 (8.7)	14 (5.2)	18 (5.3)
Treatment substitution	21 (9.1)	14 (5.2)	14 (4.1)
Treatment discontinuation	9 (3.9)	11 (4.0)	29 (8.6)
Adequacy of antimicrobial protocol	11 (4.7)	9 (3.3)	4 (1.1)
Interval adjustment	4 (1.7)	11 (4.0)	11 (3.2)
Treatment recommendations	3 (1.3)	2 (0.7)	14 (4.1)
Adequacy of drug purchase protocol	11 (4.7)	3 (1.1)	3 (0.9)
Schedule adjustment	4 (1.7)	2 (0.7)	6 (1.7)
Management of drug stability	2 (0.8)	4 (1.4)	6 (1.7)
Change of administration route	0 (0.0)	6 (2.2)	5 (1.4)
Management of food-drug interactions	3 (1.3)	4 (1.4)	2 (0.6)
Management of treatment duration	3 (1.3)	3 (1.1)	1 (0.3)
Information on drug preparation	0 (0.0)	3 (1.1)	0 (0.0)
Technical information supply	1 (0.4)	1 (0.3)	0 (0.0)
Other	21 (9.1)	4 (1.4)	2 (0.6)

The first period lasted from June 2010 to May 2011, the second period lasted from June 2011 to May 2012, and the third period lasted from June 2012 to May 2013.

that were not available at the pharmacy in charge of delivering them. Therefore, this finding might reflect flaws in the process of drug supply or the need to revise the hospital's guidelines for pharmacological treatment.

The number of PhRs considered to exert high impact on pharmacological strategy increased in the last period of the study, including those concerning dose adjustment, treatment discontinuation, and recommendation of treatment onset. This finding might be due to improvement of the clinical knowledge of the pharmacist and his/her more thorough integration with the ICU multi-professional staff. Recent literature indicates that more active participation of pharmacists in the pharmacological treatment of critically ill patients is desirable. Moreover, according to the literature, pharmacist's actions in the ICU should not be limited to providing advice to the staff but should also include active participation in decision-making regarding the maintenance of pharmacological treatment.[20]

Treatment discontinuation was recommended in 14.2% of the cases in the last period of the present study, thus agreeing with the reports by other authors.[9,15] In the study by Lee et al.,[10] this intervention occurred in 12.8% of the cases, and in the study by Reis et al.,[16] discontinuation was recommended in 18.9% of cases.

Similar to the present study, anti-infectious agents were targets of recommendations in the studies by Claus et al.[6] and Reis et al.[16] In the present study, this category of drugs was the most frequent target of PhRs.

As the main limitations of the present study, it should be observed that the study assessed PhRs made at a single hospital and in an ICU with only six beds; the recommendations were made as part of the activities of a pharmacy resident in training and without full supervision on weekends. Finally, the non-accepted PhRs and the reasons for refusal were not recorded. These limitations might result in an underestimation of the opportunities for pharmacy interventions, which might be greater than those described here. Nevertheless, the results indicate the need to improve the instrument used to record PhRs and to allow for the detection of non-accepted PhRs and the corresponding reasons. In addition, the results also indicate the urgent need to increase the coverage of bedside pharmaceutical care and make it a daily, uninterrupted practice independent from the presence and action of the resident pharmacist.

Table 2 - Distribution of the five most frequent pharmacist recommendations made at the clinical intensive care unit of a federal university hospital from June 2010 to May 2013

Five most frequent pharmacist recommendations per period	Number N (%)
1st period (N = 126; 15.1%)	
Management of adverse drug reactions	29 (3.5)
Drug supply	29 (3.5)
Management of dilutions	25 (3.0)
Adequacy of antimicrobial protocol	22 (2.6)
Treatment substitution	21 (2.5)
2nd period (N = 157; 18.8%)	
Management of drug-drug interactions	38 (4.6)
Management of adverse drug reactions	37 (4.4)
Management of dilutions	33 (3.9)
Drug supply	25 (3.0)
Dose adjustment	24 (2.9)
3rd period (N = 204; 24.5%)	
Management of dilutions	62 (7.4)
Dose adjustment	56 (6.7)
Treatment discontinuation	29 (3.5)
Management of drug-drug interactions	29 (3.5)
Drug supply	28 (3.4)

The first period lasted from June 2010 to May 2011, the second period lasted from June 2011 to May 2012, and the third period lasted from June 2012 to May 2013.

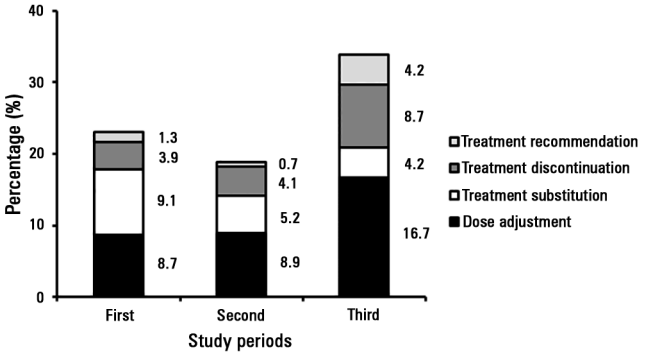

Figure 1 - Distribution of the relative frequency of four pharmacist recommendations with high impact on pharmacological strategy detected in the clinical practice of a pharmacist at the intensive care unit of a federal university hospital from June 2010 to May 2013. The first period lasted from June 2010 to May 2011, the second period lasted from June 2011 to May 2012, and the third period lasted from June 2012 to May 2013.

Due to the scarcity of similar studies in Brazil, this subject calls for further attention to the need for a paradigm shift relative to the contribution of clinical pharmacists to everyday healthcare practice in the intensive care setting, including collaborative participation aimed at improving patient safety and the quality of the care provided. The practical training afforded by multi-professional residency programs with a focus on intensive care might play a relevant role in the process of inclusion of pharmacists in the staff who provide direct care to patients in the ICU.

Table 3 - Distribution of 834 accepted pharmacist recommendations per professional category of addressee at the intensive care unit of a federal university hospital from June 2010 to May 2013

Types of pharmacist recommendations per professional category	Number N (%)
Nurses (N = 49; 5.9%)	
Schedule adjustment	12 (1.4)
Management of drug stability	12 (1.4)
Management of drug administration via tubes	10 (1.2)
Management of food-drug interactions	7 (0.8)
Management of adverse drug reactions	3 (0.4)
Information on drug preparation	3 (0.4)
Management of drug-drug interactions	2 (0.3)
Pharmacists (N = 86; 10.3%)	
Drug supply	82 (9.8)
Management of adverse drug reactions	4 (0.5)
Physicians (N = 699; 83.8%)	
Management of dilutions	120 (14.4)
Dose adjustment	100 (12.0)
Management of adverse drug reactions	84 (10.1)
Management of drug-drug interactions	67 (8.0)
Management of drug infusion duration	52 (6.2)
Treatment substitution	49 (5.9)
Treatment discontinuation	49 (5.9)
Management of drug administration via tubes	43 (5.1)
Adequacy of antimicrobial protocol	35 (4.2)
Interval adjustment	26 (3.1)
Treatment recommendation	19 (2.3)
Adequacy of managerial purchase protocol	17 (2.0)
Adequacy of pharmaceutical form	16 (1.9)
Change of administration route	11 (1.3)
Management of treatment duration	7 (0.8)
Management of food-drug interactions	2 (0.3)
Technical information supply	2 (0.3)

CONCLUSION

The present study calls attention to the changes in the role played by pharmacists in the intensive care setting in that the focus of their actions is shifting from logistic aspects and drug delivery (reactive actions) to effective clinical participation together with the multi-professional staff (proactive actions), resulting in a greater valuation of the pharmacists' recommendations in clinical practice.

RESUMO

Objetivo: Analisar 3 anos de atividades clínicas e recomendações farmacêuticas aceitas durante a rotina diária do farmacêutico na unidade de terapia intensiva clínica adulta.

Métodos: Estudo exploratório, descritivo, transversal, realizado no período de junho de 2010 a maio de 2013, em um hospital universitário, terciário, durante o qual foram categorizadas e analisadas as recomendações farmacêuticas.

Resultados: Foram analisadas 834 recomendações farmacêuticas (média anual de 278), sendo estas classificadas em 21 categorias. As recomendações farmacêuticas foram dirigidas principalmente a médicos (n = 699; 83,8%), sendo as mais frequentes: manejo de diluição (n = 120; 14,4%), ajuste de dose (n = 100; 12,0%) e manejo de evento adverso a medicamento (n = 91; 10,9%). Comparando-se os períodos, verificou-se crescimento, ao longo dos anos, das recomendações farmacêuticas com maior componente clínico e diminuição daquelas referentes a aspectos logísticos, como a provisão de medicamentos. As recomendações envolveram 948 medicamentos, tendo destaque para os anti-infecciosos de uso sistêmico.

Conclusão: A atuação do farmacêutico no cuidado intensivo evoluiu na instituição onde o estudo foi realizado, caminhando das ações reativas associadas à logística para a participação clínica efetiva junto à equipe multiprofissional (ações proativas).

Descritores: Atenção farmacêutica; Serviço de farmácia hospitalar; Farmacêuticos; Unidades de terapia intensiva

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