

Evaluation of pharmaceutical interventions in an intensive care unit of a teaching hospital

Monique Emanuela BARROS¹ , Islania Giselia ARAÚJO¹ 

¹Universidade Federal da Paraíba, João Pessoa, Brasil

Corresponding author: Barros ME, monique.fxb@gmail.com

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Abstract

Objective: The clinical pharmacist working in hospitals through actions such as pharmaceutical interventions enables a more adequate, safe and rational pharmacotherapy and reduction of drug-related problems, as well as improvement of patient care. Therefore, the objective of this study was to classify, quantify and verify the acceptability of 6 months of pharmaceutical interventions performed in an Intensive Care Unit for adults of a teaching hospital in the state of Paraíba. **Methods:** This is an observational, descriptive and retrospective study carried out from February 2019 to July 2019 in a teaching hospital. The data were collected by consulting pharmaceutical intervention forms filed at the Clinical Pharmacy unit. The sample of this study comprised 239 medical prescriptions. **Results:** A total of 354 pharmaceutical interventions were performed during the evaluated period, which were classified into 17 categories in which the most frequent were the following: withdraw medication (n=103; 29.1%), dosage (n=95; 26.8%), add medication (n=44; 12.4%), Y incompatibility (n=32; 9.0%) and reconstitution/dilution (n=23; 6.5%). Acceptability of the interventions by the medical team in this period was n=345 (97%) and only n=9 (3%) were not accepted. **Conclusion:** In view of the results disclosed, it is observed that the intensive care pharmacist is increasingly present with the multiprofessional team, participating in patient care, in view of the number of interventions performed and their acceptability by the team. Thus, their clinical conduct exerts a direct impact on the reduction of drug-related problems, therapy optimization, and promotion of rational use of medications.

Keywords: intensive care units; prescription drugs; pharmaceutical services; medication use.

Avaliação das intervenções farmacêuticas em unidade de terapia intensiva de um hospital de ensino

Resumo

Objetivo: O farmacêutico clínico atuando em hospitais por meio de ações, como as intervenções farmacêuticas, possibilita uma farmacoterapia mais adequada, segura e racional, a redução de problemas relacionados a medicamentos, bem como a melhoria do cuidado ao paciente. Diante disso, o objetivo deste estudo foi classificar, quantificar e verificar a aceitabilidade de 6 meses de intervenções farmacêuticas realizadas em uma Unidade de Terapia Intensiva Adulta de um hospital de ensino no estado da Paraíba. **Métodos:** Trata-se de um estudo observacional, descritivo e retrospectivo, realizado no período de fevereiro de 2019 a julho de 2019, em um hospital de ensino. Os dados foram coletados a partir de consulta às fichas de intervenção farmacêutica que ficam arquivadas na unidade de Farmácia Clínica. A amostra deste estudo compreendeu 239 prescrições médicas. **Resultados:** Foram realizadas durante o período avaliado, 354 intervenções farmacêuticas, sendo estas classificadas em 17 categorias em que as mais frequentes foram: retirar medicamento (n=103; 29,1%), posologia (n=95; 26,8%), adicionar medicamento (n=44; 12,4%), incompatibilidade em Y (n=32; 9,0%) e reconstituição/diluição (n=23; 6,5%). A aceitabilidade das intervenções pela equipe médica neste período foi de (n=345; 97%) e apenas (n=9; 3%) não aceitas. **Conclusão:** Diante dos resultados expostos, observa-se que o farmacêutico clínico intensivista está cada vez mais presente junto à equipe multiprofissional, participando no cuidado ao paciente, tendo em vista o número de intervenções realizadas e a aceitabilidade pela equipe, desta forma suas condutas clínicas impactam diretamente na redução dos problemas relacionados ao medicamento, na otimização da terapia e na promoção do uso racional de medicamentos.

Palavras-chave: unidade de terapia intensiva; prescrição de medicamentos; atenção farmacêutica; uso de medicamentos.



Introduction

In the hospital setting, the Intensive Care Unit (ICU) is the place where the patients are more vulnerable to drug-related problems (DRPs). This can be associated both with the critical nature of their diseases and to the presence of polypharmacy, use of high-risk medications and constant changes in pharmacotherapy.^{1,2,3,4}

In view of this scenario, the Pharmacy Department of the Brazilian Association of Intensive Care Medicine was created in Brazil in 2008, a fact that advocated the presence of pharmacists in the multidisciplinary intensive care team.^{4,5}

In addition to that, in 2010, the National Health Surveillance Agency published Collegiate Board Resolution No. 7, which deals with health care in ICUs and consolidated the mandatory character of the presence of clinical pharmacists in this care unit.⁶

In this context, intensivist clinical pharmacists stand out for their role in promoting rational use of medications, in optimizing pharmacotherapy for positive outcomes, and in reducing costs and harms to the patient.⁷ It is for this reason that the following are duties inherent to pharmaceutical monitoring: to provide pharmaceutical guidance, to assess medication use, and to conduct pharmacotherapy monitoring.⁸

Pharmaceutical Care Network Europe defines a DRP as any event related to pharmacotherapy that causes, or might cause, negative clinical outcomes.^{9,10} DRPs derive from errors in medication use throughout care, such as prescription, dispensing and administration;¹⁰ and they can be associated with the user, the medication and the health professionals.¹¹

The Federal Council of Pharmacy (*Conselho Federal de Farmácia*, CFF), through Resolution No. 585 of August 2013, regulated the clinical duties of the pharmacist and recognized pharmaceutical interventions (PhIs) as actions by the professional to solve or prevent negative clinical results arising from medication use, planned, documented and performed with the user and the health professionals and which are part of the pharmaceutical monitoring process.^{12,13,14,15}

The clinical pharmacists' work routine is incorporated into the performance of various types of interventions with regard to the therapy, making it necessary for the PhIs to be classified and documented, in order to improve this pharmaceutical skill and the quality of care provided.¹⁶

According to Noormandi et al.¹⁷, in a systematic review that assessed the impact of the interventions and activities by clinical pharmacists, as well as clinical and economic outcomes in Iran, the interventions play an important role in optimizing therapy and reducing medication-related costs, as well as improving care and enhancing patient safety.

In the health systems, the professional pharmacist stands out for representing one of the last opportunities to identify, correct or reduce eventual risks related to the drug therapy.¹⁸ PhIs that propose rational use of medications are necessary and accepted; however, reports on this practice are still scarce.⁴

This paper aims at classifying, quantifying and verifying the acceptability of pharmaceutical interventions recorded during six months of work by intensivist clinical care pharmacists in a teaching hospital.

Methods

An observational, descriptive, retrospective and quantitative study, in which the Pharmaceutical Intervention forms of the Clinical Pharmacy Service of the Lauro Wanderley University Hospital (*Hospital Universitário Lauro Wanderley*, HULW)/UFPB/Campus I, João Pessoa/PB, specifically of the Intensive Care Unit for adults, were analyzed with the objective of identifying the clinical impact of these interventions for the sector. The project was approved by the Research Ethics Committee of the HULW on June 11th, 2020 under CAAE number 31190520.9.0000.5183, with authorization of Informed Consent Form waiver.

The Clinical Pharmacy sector was created in March 2015 through the arrival of the Brazilian Hospital Services Company (*Empresa Brasileira de Serviços Hospitalares*, EBSEH) and, in April 2015, the pharmaceutical interventions (PhIs) were instituted in the hospital routine, with the ICU for adults as their first setting.

The ICU for adults where the PhIs were conducted has fourteen beds. In general, the hospital treats the most varied clinical cases, the ICU is mixed and receives patients aged from 18 years old. The multidisciplinary team is made up of daily physicians, on-duty physicians, nurses, dentists, physiotherapists, speech therapists, psychologists, social workers, nutritionists, occupational therapist, nursing technicians and pharmacists.

In addition to that, theoretical-practical training activities are carried out for the medical residency programs (internal medicine and intensive care) and multidisciplinary residency programs with a concentration area in critically-ill patients. The team also receives undergraduate and internship students from several university courses linked to the hospital.

The data were collected by the resident pharmacist, by consulting the Pharmaceutical Intervention forms filed in the Clinical Pharmacy service, an instrument used by the 15 clinical pharmacists of the HULW/UFPB Clinical Pharmacy Unit in their professional practice.

The hospital had an individualized drug distribution system for a 24-hour period, the prescriptions are handwritten (prepared in two copies), and there was not any electronic prescription and medical record system.

This study comprised the PhIs performed in the monitoring of patients with a minimum hospitalization period of 24 hours in the ICU for adults and who used medications during the period from February 2019 to July 2019. There was no distinction criterion regarding gender, age and comorbidities.

The classification of the pharmaceutical interventions analyzed in the study took into account the standardized nomenclature in the official PHI form of the HULW Clinical Pharmacy sector, namely: drug interaction, dose adjustment, dosage, add medication, withdraw medication, substitute medication, infusion rate, administration route, reconstitution, dilution, scheduling, infusion time, medication via tube, pharmaceutical presentation, culture information, antimicrobial de-escalation, non-standardized medication, consider information from outpatient exams, electrolyte adjustment, reconciliation and Y incompatibility, among others.

For the statistical analysis, the data were typed in a Microsoft Office Excel 2010 electronic spreadsheet, where descriptive statistics techniques were applied. The results were presented in frequency distribution tables, charts and graphs.



Results

From February 2019 to July 2019, 239 medical prescriptions were evaluated and the clinical pharmacists conducted 354 pharmaceutical interventions.

The classification and frequency observed for the 354 PhIs in 17 types are presented in Table 1.

Table 1. Classification and number of pharmaceutical interventions conducted in the Intensive Care Unit of a teaching hospital (Paraíba, 2020)

Pharmaceutical interventions	n (%)
Withdraw medication	103 (29.1)
Dosage	95 (26.8)
Add medication	44 (12.4)
Y incompatibility	32 (9.0)
Reconstitution/Dilution	23 (6.5)
Administration route	16 (4.5)
Substitute medication	13 (3.7)
Reconciliation	8 (2.3)
Drug interaction	5 (1.4)
Infusion time	4 (1.1)
Scheduling	4 (1.1)
Culture information	0 (0.0)
Antimicrobial de-escalation	1 (0.3)
Medication via tube	1 (0.3)
Consider laboratory tests	1 (0.3)
Non-standardized medication	0 (0.0)
Others	4 (1.1)
Total	354 (100.0)

The most frequent interventions: withdraw medication (n=103; 29.1%), adjust dosage (n=95; 26.8%), add medication (n=44; 12.4%), Y incompatibility (n= 32; 9%) and reconstitution/dilution (n=23; 6.5%), were exemplified in Table 2.

Table 2. Description of the pharmaceutical interventions conducted in the Intensive Care Unit of a teaching hospital (Paraíba, 2020).

Classification of the intervention	Description of the case	Pharmaceutical intervention	Resolution
Withdraw medication	Dipyron 1 g, IV, prescribed every 6 hours	Withdrawal is recommended as the patient no longer had fever.	The physician withdrew dipyron from the prescription.
Dosage	Fluconazole, 400 mg, IV, prescribed every 12 hours. Second day of use of the antibiotic, still with the same dose.	Adjustment of the fluconazole dose was suggested, to 400 mg every 24 hours. It is recommended that, in the first 24 hours, the dose is 400 mg 12/12h; from the second dose on, it must be adjusted to 400 mg once a day.	The physician adjusted the fluconazole dose to 400 mg every 24 hours on the prescription.
Add medication	Inpatient in the ICU presenting more than 3 days without bowel movements. Not using any prokinetic or laxative.	Suggestion to add the bromopride prokinetic, 10 mg, IV, every 12 hours to the prescription.	The physician added bromopride to the prescription.
Y incompatibility	Patient using vancomycin, IV, and omeprazole, IV. Both medications were being administered through the same catheter lumen at the same time.	A change in the administration time for the medications was suggested since, if administered at the same time, there is physical incompatibility with formation of a whitish precipitate.	The Nursing staff scheduled vancomycin and omeprazole at different times.
Reconstitution/Dilution	Omeprazole, IV, 40 mg, was prescribed every 24 hours diluted in distilled water.	It is recommended to dilute in a proper diluent, according to the manufacturer's instructions, and not in distilled water.	The physician adjusted dilution in the prescription to proper diluent.

Information referring to the Micromedex® and UpToDate® databases used in the Clinical Pharmacy during the study period. IV: Intravenous.

In relation to acceptability of the pharmaceutical interventions by the medical team, Graph 1 shows that 97% (n=345) were accepted, generating adjustments in pharmacotherapy. However, the unaccepted interventions (n=9; 3%), although relevant, had as reason for non-acceptance the fact that they were prescriptions copied from the previous day by another prescriber without proper correction; in addition, the on-duty physician did not adjust medication dose, due to improvement in the patient's liver function, even if this dose adjustment was necessary.

Discussion

The clinical pharmacist, working together with the multidisciplinary team, provides guidance to the professionals regarding safe and rational use of medications, enabling quality in patient therapy.^{19,20} Therefore, these professionals are fundamental to identify, reduce and correct possible risks inherent to drug therapy, with the patient benefiting from their actions.^{20,21}

DRPs are considered one of the main factors for the onset of adverse events, mostly due to medication errors, which cause changes in drug therapy and increase the mortality and morbidity rates, as well as prolonged hospitalization time in patients and increase in the costs associated with their treatment.²² A number of studies show that, for every ten patients admitted to a hospital unit, one runs a potential risk of presenting some medication error.^{23,24}

Drug-related adverse events can cause health problems in the patients. Prescription errors are one of the main causes of adverse events and have a high potential to cause harmful consequences for the user; therefore, pharmaceutical interventions aim at preventing such errors.^{24,25}

The practice of PhIs and pharmacotherapy monitoring is a key element in reducing DRPs, enhancing therapy effectiveness and mitigating the risks associated with the therapy.^{26,27}

The pharmaceutical interventions carried out during the study accounted for a total of 354, with the suggestion of medication withdrawal being the most prevalent (n=103; 29.1%). Comparing our results with those in the literature, Reis et al.²⁸ showed the need to discontinue medications in 18.97% of the prescriptions evaluated in a teaching hospital.

In addition to that, the dosage adjustment, add medication, Y incompatibility and reconstitution/dilution interventions were also frequent. In the study by Silva et al.⁴ the dose or dosage adjustment intervention, as well as dilution/reconstitution and incompatibility, presented high frequency values, similar to the data obtained in this study. In a study carried out in the intensive care unit of the Aristides Maltez Hospital, located in Bahia, introduction of necessary medications (34%) was among the five most prevalent interventions.²⁹

As for the most frequent interventions, shown in Table 2, the recommendation is to discontinue the use of dipyron 1g, IV, prescribed every 6 hours, since the patient no longer had fever. This intervention exerts a direct impact on pharmacoeconomics, since the medication was being used without clinical indication, leading to an unnecessary cost, in addition to impacting on patient safety, rationalizing use of the drug and avoiding an adverse drug reaction, for example.

Literature data show that pharmacotherapy monitoring reduces by 78% the incidence of medication errors, thus decreasing the incidence of adverse events and improving the quality of the prescriptions.³⁰

Thus, it is observed that the clinical pharmacist is the professional trained to promote rationalization and review of drug therapy, as well as to carry out interventions aimed at enhancing patient safety, reducing mortality, therapy costs and hospitalization time, as well improving treatment effectiveness.^{31,32}

Of the interventions performed, high acceptability (n=345; 97%) was observed, resulting in changes in pharmacotherapy. This result is similar to the one found in a study conducted in Recife in 2013, which presented 98.2% acceptance of the interventions.³³ In their results, Santos et al.²⁹ also presented a high percentage of intervention acceptance: 80%. Data from the international literature also show high acceptability: in their study in the hospital setting, Semcharoen et al.³⁴ obtained 84.7% of accepted interventions.

In a systematic review that evaluated the effectiveness of interventions in the prescription of potentially inappropriate medications for older adults, it was observed that pharmaceutical care and its multidisciplinary performance reduced the prescription of inappropriate medications and presented benefits for the patients.³⁵

It is known that clinical pharmacists promote their interventions together with the physician and provide guidance to nursing and other health professionals regarding the characteristics of the medications, thus allowing optimization of treatment effectiveness and avoiding a possible adverse event.³² Thus, it is fundamental that this team be open to dialog and take into account the considerations referring to the drug-related problems detected after evaluation of the prescription by the pharmacist, since care with the therapy and the patient does not only involve medical activities, but also those by the other health professionals.³⁶

The following is to be noted as study limitations: absence of electronic prescription and medical records in the aforementioned hospital, which precluded retrieval of the patients' clinical and social data.

The high levels of acceptability of interventions in the literature suggest that the clinical pharmacy service was fundamental for careful pharmacotherapy monitoring of the patients, reasserting

the role of this professional with the multidisciplinary team in patient care and clarifying doubts about medications. Medication errors are present in the hospital routine, and pharmaceutical interventions provide benefits for patient safety, in addition to improving therapeutic outcomes, promoting rational use of medications and ensuring cost-effectiveness of pharmacotherapy.

Conclusion

Given the results obtained, it is observed that a large number of pharmaceutical interventions were conducted in critically-ill patients. Most of them were widely accepted by the prescribers, evidencing the importance of clinical pharmacists in rational and safe pharmacotherapy, as well as their effective participation in the multidisciplinary team and their contribution to health promotion, protection and recovery of the patient.

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Collaborators

MEB and IGA were responsible for conception and design, data analysis and interpretation, as well as writing of the article and critical review of the intellectual content.

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Conflict of interests statement

The authors declare that there are no conflicts of interests in relation to this article.

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