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Evaluation of the profile of interventions performed by clinical pharmacist and multidisciplinary after the implementation of the FASTHUG methodology in an intensive care unit

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Abstract

Objective: To evaluate the profile of pharmaceutical and multidisciplinary interventions after the implementation of the FASTHUG mnemonic in a multidisciplinary meeting of an adult intensive care unit and the presence of a clinical pharmacist in this team. **Methods:** Cross-sectional study, in which 225 patients were monitored, through the analysis of demographic and clinical data from electronic medical records provided by the clinical pharmacy service of the University Hospital of Western Paraná and evaluation of interventions carried out through monitoring indicators. Multidisciplinary and pharmaceutical interventions were recorded during multidisciplinary meetings and classified according to the mnemonic FASTHUG, which covers aspects such as nutrition, analgesia, sedation, thromboembolism prophylaxis, elevated headboard, stress ulcer prophylaxis and glycemic control. **Results:** 1078 interventions were carried out, with an average of 4.79 interventions per patient monitored. The most frequent multidisciplinary interventions were addition of necessary medication 248 (27.2%), diet optimization 145 (15.9%), analgesia optimization 128 (14%), glycemic control optimization 109 (12%), frequency of administration and suspension of unnecessary medication, both 68 (7.5%). The most common pharmaceutical interventions were optimization of administration frequency 40 (24.3%), addition of necessary medication 18 (11%), suspension of unnecessary medication 17 (10.3%) and change in dose reduction 15 (9.1%). Regarding patient outcomes, 75.1% were discharged to the ward, 24.4% died and 0.4% were transferred to another hospital. **Conclusion:** The implementation of the FASTHUG mnemonic in an intensive care unit provided a standardization of language among the multidisciplinary team during clinical meetings, as well as enabling the evaluation of essential points of pharmacotherapy by the clinical pharmacist.

Keywords: *FASTHUG*; multidisciplinary team; intensive care unit; critical patient; clinical pharmacist.

Avaliação do perfil das intervenções realizadas pelo farmacêutico clínico e multidisciplinares após a implantação da metodologia FASTHUG em uma unidade de terapia intensiva

Resumo

Objetivo: Avaliar o perfil das intervenções farmacêuticas e multidisciplinares após implantação do mnemônico *FASTHUG* em reunião multidisciplinar de uma unidade de terapia intensiva adulta e a presença de um farmacêutico clínico nesta equipe. **Métodos:** Estudo transversal, onde foram acompanhados 225 pacientes, por meio da análise dos dados demográficos e clínicos a partir de prontuário eletrônico disponibilizados pelo serviço de farmácia clínica do Hospital Universitário do Oeste do Paraná e avaliação das intervenções realizadas através dos indicadores de acompanhamento. As intervenções multidisciplinares e farmacêuticas foram registradas durante as reuniões multidisciplinares e classificadas de acordo com o mnemônico FASTHUG, que abrange aspectos como alimentação, analgesia, sedação, profilaxia de tromboembolismo, cabeceira elevada, profilaxia de úlcera de estresse e controle glicêmico. **Resultados:** Foram realizadas 1078 intervenções, com uma média de 4,79 intervenções por paciente acompanhado. As intervenções multidisciplinares mais frequentes foram acréscimo de medicamento necessário 248 (27,2%), otimização de dieta 145 (15,9%), otimização de analgesia 128 (14%), otimização do controle glicêmico 109 (12%), otimização da frequência de administração e suspensão de medicamento não necessário, ambos 68 (7,5%). Já as intervenções farmacêuticas mais comuns foram otimização da frequência de administração 40 (24,3%), acréscimo de medicamento necessário 18 (11%), suspensão de medicamento não necessário 17 (10,3%) e alteração de redução de dose 15 (9,1%). Em relação aos desfechos dos pacientes, 75,1% receberam alta para a enfermaria, 24,4% foram a óbito e 0,4% foram transferidos para outro hospital. **Conclusão:** A implantação do mnemônico *FASTHUG* em uma unidade de terapia intensiva proporcionou uma padronização na linguagem entre a equipe multidisciplinar durante as reuniões clínicas, bem como, possibilitou a avaliação de pontos essenciais a farmacoterapia pelo farmacêutico clínico.

Palavras-chave: *FASTHUG*; equipe multidisciplinar; unidade de terapia intensiva; paciente crítico; farmacêutico clínico.

Introduction

With the objective of devising a standardized and easy-to-understand approach, the FASTHUG mnemonic was created by physician *Jean-Louis Vincent*, in order to systematically contribute to the care organization, safety and effectiveness for critically-ill patients in Intensive Care Units (ICUs)[1-2]. Using this tool to care for critically-ill patients minimizes the risk of mortality and errors in the care process, when applied in multidisciplinary visits or meetings[3]; it also makes it possible to assist in care and in the reduction of daily errors and possible adverse events during hospitalization[4] and facilitates communication between professionals and the follow-up of courses of action previously defined by the team, ensuring better patient care[5].

Bearing in mind that patients with critical and unstable clinical conditions are admitted to an ICU, susceptible to healthcare-associated infections and risk factors such as ventilatory support, high doses of immunosuppressive medications and drugs, constant monitoring and the presence of a multidisciplinary team become necessary[4], for being high-complexity care procedures.

It is known that the presence of a multidisciplinary team in the ICU corroborates success of the treatment and therapeutic efficacy of the patient, in addition to reducing the mortality rates and hospitalization times[6]. This team is comprised by professionals such as physicians, nurses, physiotherapists, dentists, clinical pharmacists, nutritionists and psychologists. Clinical pharmacists assist in planning, elaboration and implementation of a therapeutic plan, aiming to prevent and avoid drug-related events[7-8]. Their presence in the multidisciplinary team is directly related to the pharmacotherapy optimization and to the reduction of prescription errors[6], as these professionals work in all components of the process involving medications, from prescription, dispensing and administration to monitoring[10], thus ensuring treatment safety and effectiveness[8-9].

Thus, the objective of this study is to evaluate the profile of pharmaceutical and multidisciplinary interventions after implementing the *FASTHUG* mnemonic in a multidisciplinary meeting at an Intensive Care Unit for adults and the presence of a clinical pharmacist in this team, as well as to describe the patients' profile.

Methods

This is a cross-sectional study carried out from April to September 2021, where patients admitted to the ICU-Adults of the University Hospital of Western Paraná (*Hospital Universitário do Oeste do Paraná*, HUOP) were selected and the multidisciplinary interventions were carried out during the period in which the multidisciplinary meetings routinely took place on Tuesdays and Thursdays.

HUOP is a teaching hospital with 238 beds located in the municipality of Cascavel, state of Paraná. It is linked to the State University of Western Paraná (*Universidade Estadual do Oeste do Paraná*, UNIOESTE) and exclusively serves the Unified Health System (*Sistema Único de Saúde*, SUS). It is characterized as a tertiary-level hospital and is considered a reference in high-complexity assistance in the High-risk pregnancy, Traumatology, Vascular surgery and Neurology areas.

The inclusion criteria considered for this study corresponded to all the patients admitted to the ICU-Adults and who remained hospitalized for more than 24 hours. The exclusion criterion were patients admitted during weekends and on holidays, as there was no monitoring by the Pharmacy service in these files.

For the multidisciplinary meetings, a Multiprofessional Therapeutic Plan for the ICU-Adults in the form of a checklist was standardized and employed (Annex 1), based on the seven aspects from the *FASTHUG* methodology[1-2].

In this acronym, each letter represents a variable to be analyzed and evaluated by the multidisciplinary team. It is used in the form of a checklist and involves the following terms: *Feeding*; *Analgesia*; *Sedation*; *Thromboembolic prevention*; *Head of bad elevated*; *Stress Ulcer prophylaxis*; and *Glucose control*[2].

The sociodemographic and clinical data, as well as the outcomes (death and discharge), were obtained from the *Tasy®* electronic medical records available in the hospital. And it was with them that the monitoring forms for critically-ill patients were filled-in by the Clinical Pharmacy service (Annex 2). Thus, it was possible to review the pharmacotherapy, analyze the clinical data of each patient based on their medical records/prescriptions and perform the relevant interventions during meetings with the multidisciplinary team.

The intensive care physician was responsible for leading the multidisciplinary meeting, which was always held in a room with the other professionals involved. Following the Therapeutic Plan, each question addressed was answered by the professional in charge and, whenever necessary, the questions were discussed and multidisciplinary interventions were carried out by intensive care physicians, specialist physicians, nurses, clinical pharmacists, nutritionists, dentists, physiotherapists and the respective residents of each area.

The pharmaceutical interventions were made in-person as suggestions during the meeting with the multidisciplinary team, and subsequently recorded in the pharmaceutical evolutions in the Tasy® electronic medical record.

As each question addressed was answered, a therapeutic goal for each patient was defined. Subsequently, the therapeutic plans were annexed to the medical records.

Afterwards, the clinical pharmacist classified the profile of the interventions performed, as follows: multidisciplinary and pharmaceutical. The multidisciplinary interventions were characterized as those performed and agreed upon during the meeting by any professional other than pharmacists and accepted at the meeting itself. In turn, the pharmaceutical ones were those previously identified during the pharmacotherapy analysis, presented during the meeting and, if accepted by all team members, considered as accepted interventions. Subsequently, the accepted pharmaceutical interventions were recorded in the evolutions indicated by the clinical pharmacist in the electronic medical chart of the patient in question. The classification regarding the types of intervention was defined based on the concepts of Pharmaceutical Care and of Drug-Related Problems[11] (Annex 3).

The data were incorporated into a Microsoft Excel® spreadsheet, where the descriptive statistical analysis was performed with mean values and absolute and relative frequencies. The paper was approved by the Research Ethics Committee of the State University of Western Paraná under opinion No. 1,872,685.

Results

A total of 225 patients were monitored from April to September 2021. Of them, 140 (62.2%) were men and 85 (37.8%) were women, and their age varied from 18 to 100 years old. Nearly 138 (61.3%) presented one or more comorbidities, 48 (21.4%) reported no comorbidities, and 39 (17.3%) did not have this information included in their electronic medical records. Regarding the outcomes, 169 (75.1%) were discharged to the ward, 55 (24.4%) evolved to death and 1 (0.4%) was transferred to another hospital (Table 1). 1,078 interventions were carried out by the multidisciplinary team, including those performed by the clinical pharmacist during the meetings, with a mean of 4.79 interventions per patient monitored, classified according to Annex 3.

Table 1. Sociodemographic information of the patients monitored from April to September 2021.

Variables		n (%)
Gender	Female	85 (37,8)
	Male	140 (62,2)
Age	18-59 years old	132 (58,7)
	≥60 years old	93 (41,3%)
Outcome	Discharge from the ICU	169 (75,1)
	Death	55 (24,4)

Among the 913 multidisciplinary interventions carried out, the main ones were addition of necessary medication (n=248 [27.2%]), diet optimization (n=145 [15.9%]), analgesia optimization (n=128 [14%]), glucose control optimization (n=109 [12%]), administration frequency optimization (n=68 [7.5%]), discontinuation of unnecessary medication (n=68 [7.5%]) and addition of antimicrobial (culture-guided) (n=21 [2.3%]).

Among the 165 pharmaceutical interventions carried out, the main ones were administration frequency optimization (n=40 [24.3%]), addition of necessary medication (n=18 [11%]), discontinuation of unnecessary medication (n=17 [10.3%]), dose reduction change (n=15 [9.1%]), change in pharmacotherapy due to inventory management (n=12 [7.3%]) and analgesia optimization (n=12 [7.3%]).

In order to use the mnemonic rule, the interventions were grouped and classified according to the acronym, as per Annex 4, and presented in Table 3.

The class of medications used for stress ulcer prophylaxis includes proton pump inhibitors and, in our study, omeprazole was employed in its capsule, solution and injectable presentations. The interventions related to all omeprazole presentations were counted and distributed in Table 3 and, according to the FASTHUG mnemonic, they total n=77 (10.5%).

Table 2. Profile of the multidisciplinary and pharmaceutical interventions performed during the multidisciplinary visits at the ICU-Adults from April to September 2021.

Types of interventions	Multidisciplinary		Pharmaceutical		Total	
	N = 913		N = 165		N = 1078	
	N	%	N	%	Total	%
Addition of unnecessary medication	248	27,2	18	11	266	24,7
Diet optimization	145	15,9	5	3	150	13,9
Analgesia optimization	128	14	12	7,3	140	13
Glucose control optimization	109	12	5	3	114	10,6
Administration frequency optimization	68	7,5	40	24,3	108	10
Discontinuation of unnecessary medication	68	7,5	17	10,3	85	7,9
Addition of elastic socks or compressive pneumatic boots	24	2,6	6	3,6	30	2,8
Dose reduction change	15	1,6	15	9,1	30	2,8
Change in the administration route	20	2,2	5	3	25	2,3
Change in pharmacotherapy due to inventory management	12	1,3	12	7,3	24	2,2
Discontinuation due to treatment termination	16	1,8	7	4,3	23	2,1
Addition of antimicrobial (culture-guided)	21	2,3	0	0	21	1,9
Dose increase change	9	1	3	1,8	12	1,1
Antimicrobial (culture-guided)	9	1	0	0	9	0,8
Scheduling	2	0,2	6	3,6	8	0,7
Discontinuation due to ADR/clinical damage	4	0,4	2	1,2	6	0,5
Adjustment by renal function	2	0,2	2	1,2	4	0,4
Discontinuation of non-pharmacological measure	4	0,4	0	0	4	0,4
Discontinuation due to surgical procedure	4	0,4	0	0	4	0,4
Adjustment according to vancocinemia	1	0,1	3	1,8	4	0,4
Medication reconciliation	0	0	3	1,8	3	0,3
Addition of non-pharmacological measure	3	0,3	0	0	3	0,3
Dilution adequacy	1	0,1	2	1,2	3	0,3
Medication error (therapeutic duplicity)	0	0	1	0,6	1	0,1
Medication error (underdose)	0	0	1	0,6	1	0,1
Total	913	100	165	100	1078	100

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Among the interventions performed, both multidisciplinary and pharmaceutical, the antimicrobial class had a frequency corresponding to n=86 (8%) in relation to other classes such as analgesia, feeding, glucose control and thromboembolic prophylaxis, as presented in Table 4.

Table 3. Frequency of the multidisciplinary and pharmaceutical interventions according to the FASTHUG mnemonic performed during the multidisciplinary visits at the HUOP ICU-Adults from April to September 2021.

Intervenções conforme FASTHUG		**N = 731**	
		N	**%**
F	Feeding	155	21,2
A	Analgesia	278	38
S	Sedation	8	1,1
T	Thromboembolism prophylaxis	89	12,2
H	Delirium[1]	4	0,6
U	Stress ulcer prophylaxis	77	10,5
G	Glycemic control	120	16,4

[1] For this study, the letter H" from the mnemonic was considered as "Delirium", according to the reference by Mabasa et al. (2011).

Discussion

In a study conducted by Ribeiro *et al*. (2019) at a private institution in Salvador, Bahia, the number of pharmaceutical interventions performed per patient-day was evaluated, involving patients admitted to the ward, ICU and semi-intensive ICU, in which there was a significant increase over the period. In this study, 1.4 interventions per patient-day were performed in 2012; 5.2 in 2013; and 8.2 in 2014. Another factor to be considered in the Bahia study was in relation to the number of units evaluated and the study extension in time, as it showed the experience, role and importance of clinical pharmacists in the multidisciplinary team and how much their work has evolved over time. In addition to that, it presented the importance of carrying out studies with a longer follow-up times and of the possible comparison between years, showing that, probably in the long term, it will be possible to notice the evolution of the clinical pharmacist's performance in our study, where 1,078 interventions were carried out during the multidisciplinary meetings with a mean of 4.79 interventions per patient monitored. Of these, 165 were performed by the clinical pharmacist, which corresponds to 0.73 interventions per patient.

In a study carried out from March to August 2019 in the ICU of the Aristide Maltez Hospital located in Salvador, Bahia, it was observed that the intervention of adding a necessary medication is among the five most frequent ones[13]; similarly, in our study, the intervention of adding a necessary medication was the most frequent, corresponding to a total of n=266 (24.7%), of which 18 (11%) were performed by the pharmacist. It also involved the inclusion of any medication class, including, for example, stress ulcer prophylaxis (Omeprazole in injectable, solution and capsule forms), thromboembolic prophylaxis, prokinetics and electrolytes, such as Potassium Chloride (KCl) in injectable forms and solution for oral administration.

In a research study carried out by Lima *et al*. (2021) where the FASTHUG-MAIDENS mnemonic was used, of all 860 interventions performed, n=23 (2.7%) were related to feeding. Critical patients are in intense catabolism and, in most cases, they are unable to receive adequate nutrition through the usual route. For these patients it is extremely important to maintain the proper nutritional supply, in order to obtain better clinical outcomes. Consequently, having an individually-adapted nutritional strategy for each patient is fundamental for their rehabilitation[15]. In our study, which used the FASTHUG mnemonic, the interventions related to adding, discontinuing, increasing and reducing diet volumes, both orally and via nasogastric tubes, were classified as diet optimization, as they were performed according to each patient's need/safety. These interventions totaled n=150 (13.9%), 5 of which were carried out by the pharmacist, and comprised the second most frequent classification accounted for by the mnemonic rule, adding up to n=155 (21.2%) and evidencing the importance and the extent to which it was necessary to intervene in the diet of the patients followed-up.

Dias *et al.* (2019) analyzed the electronic prescriptions and pharmaceutical interventions for patients admitted to the ICU of a public hospital from Santa Catarina, between February and July 2017. Among the 499 prescriptions analyzed, n=409 (91%) required interventions, totaling 664 interventions performed. When distributed by therapeutic class, it was verified that the analgesics one was the most frequent, totaling n=219 (23%). In turn, in our study and in relation to analgesia optimization n=140 (13%), when analyzed by type of intervention (Table 2), it can be seen that 12 (7.3%) of them were performed by clinical pharmacists.

Table 4. Profile of the multidisciplinary and pharmaceutical interventions related to antimicrobials performed during the multidisciplinary visits at the HUOP ICU-Adults from April to September 2021.

Types of interventions	**N = 86**			
	Multidisciplinary	**%**	**Pharmaceutical**	**%**
Addition of antimicrobial (culture-guided)	21	31,3	0	0
Discontinuation due to treatment termination	16	23,9	7	36,8
Addition of necessary antimicrobial	10	14,9	0	0
Antimicrobial (culture-guided)	9	13,4	0	0
Discontinuation of unnecessary antimicrobial	5	7,5	0	0
Adjustment by renal function	2	3	2	10,5
Dose reduction change	1	1,5	0	0
Administration frequency optimization	1	1,5	4	21,1
Dilution adequacy	1	1,5	2	10,5
Adjustment according to vancocinemia	1	1,5	3	15,8
Scheduling	0	0	1	5,3
Total	67	100	19	100

Clinical pharmacists included in the multidisciplinary team can contribute to standardizing the insulin therapy through the selection of appropriate treatment protocols, participate in the management of insulin product formulary lists, and contribute to minimizing the risk of insulin-related medication errors. In addition to that, they can help minimize the risk of inappropriate dose scheduling and work collaboratively with Nutrition and Nursing services to optimize administration of this medication[17]. Regarding glucose control optimization, which encompasses all interventions related to changes in the frequency (increase or decrease) of capillary blood glucose checks, incorporating insulin therapy and adding glucose solution, it was observed that they corresponded to n=114 (10.6%) of the total number of interventions performed (Table 2) whereas using the mnemonic rule, they totaled n=120 (16.4%) interventions (Table 3).

Hospitalized patients develop risk factors for venous thromboembolism (VTE) and chemoprophylaxis with anticoagulants at prophylactic doses, such as enoxaparin (low molecular weight heparin) and unfractionated heparin, is important. Along with the multidisciplinary team, clinical pharmacists can assess the right moment for an intervention, as they analyze risk factors in each patient. Therefore, they can suggest both prophylaxis initiation and discontinuation, always aiming at patient safety[14].

When analyzed according to the *FASTHUG* mnemonic, prophylaxis for thromboembolism was frequent in n=89 (12.2%) of the interventions, with n=64 (71.9%) performed by the team and n=25 (28.1%) by pharmacists. They include the addition of compression stockings, pneumatic compression boots, as well as addition and/or discontinuation of enoxaparins and/or heparins. In the study by Lima *et al.* (2021), n=32 (3.7%) interventions related to Venous Thromboembolism (VTE) prophylaxis were performed, which include pharmacological prophylaxis initiation and discontinuation. This study, as well as our result, shows us the importance of using all preventions means regarding thromboembolic prophylaxis.

The class of anticoagulants was one of the main ones involved in the pharmaceutical interventions carried out from March to December 2016 in an ICU of a university hospital, with n=20 (2.71%), in the study carried out by Araújo *et al*. (2017). In another study, developed by Reis *et al.* (2013), enoxaparin is among the medications predominantly involved in dose errors (13.76%), showing the need and importance of the interventions related to this prophylaxis measure.

Stress ulcer prophylaxis is widely used for patients admitted to the ICU, due to the high risk of upper gastrointestinal bleeding, in which the use of acid suppressors is recommended[20]. However, their use can lead to complications such as hospital-acquired pneumonia, gastrointestinal infections and potential risk of drug interactions[21].

As was the case in the studies by Fidelis *et al.* (2015) and Reis *et al.* (2013), omeprazole was also one of the main medications that required more interventions. Thus, in the study developed by Araújo *et al*. (2021), the authors observed that it is necessary to plan and develop intervention plans in order to minimize inappropriate use of acid suppressors, mainly when related to stress ulcer prophylaxis.

Regarding change in the administration route, n=25 (2.3%) interventions were performed, called "changes in administration route". Of them, n=5 (3%) were performed by the clinical pharmacist. It is known that inappropriate use of drugs for stress ulcer prophylaxis and late changes in the administration route can be associated with potential adverse events, prolonged hospitalization times and higher costs, where a change in the administration route can effectively contribute to pharmacoeconomics and aim at ensuring that the medication will be administered via the recommended route[24,25].

As pharmacists play a fundamental role in verifying the pharmaceutical form that will be administered, as well as in evaluating the prescription with regard to dose and frequency, in this study it was observed that interventions related to administration frequency optimization of the medications, which correspond to n=108 (10%) of the total interventions performed, were the main ones performed by the pharmacist (n=40 [24.3%]) in the multidisciplinary meetings (Table 2).

In a single-center study, carried out in a private hospital in the city of São Paulo, from January to December 2012, in which interventions carried out in the period were analyzed and quantified, it was found that the administration frequency adjustment intervention was one of the most frequent n=407 (2.56%), as well as other interventions related to dose adjustment and route of administration[25]. It can be seen that, from a total of 933 Drug-Related Problems (DRPs) found in the study by Reis *et al*. (2013)[19], n=27 (2.89%) were related to the "administration interval".

Among the interventions related to "discontinuation of unnecessary medication", with a total of n=85 (7.9%), 17 were performed by the clinical pharmacist. When comparing our results to those in the literature, Barros, Araújo (2021) found that the medication withdrawal intervention (n=103 [29.1%]) was the most frequent one among the total number of pharmaceutical interventions carried out (n=354) from February to July 2019 in the ICU of a university hospital from João Pessoa, Paraíba. In another study, Reis *et al*. (2013) showed the need to discontinue medications in n=177 (18.97%) pharmaceutical interventions out of a total of 933 performed in prescriptions evaluated from July 2011 to July 2012 at a tertiary-level teaching hospital in Brazil.

The interventions related to antimicrobials include culture-guided addition and discontinuation, adjustment according to vancocinemia, discontinuation due to treatment termination, adjustment by renal function, and a few more described in Table 4. They were classified and distributed, totaling n=86 (8%) of all the interventions performed, with n=19 (22%) made by the pharmacist included in our study. In turn, in the research study conducted by Lima *et al*. (2021), antimicrobials were the main medications in need of pharmaceutical intervention, accounting for n=364 out of a total of 1,145 interventions carried out over a 4-month period at the Clinical Intensive Care Unit for adults of the University Hospital of the Federal University of Maranhão, as well as in a multicenter study carried out by Ourghanlian *et al.* (2019), where it was shown that there was a reduction in consumption of this class when all the prescriptions were reviewed by a pharmacist[14,19,22]. Consequently, it can be seen that pharmaceutical interventions exert a positive impact on reducing the consumption of antimicrobials[27].

A number of research studies show that daily interventions based on a checklist improve countless processes, reducing hospitalization time and mortality in critically-ill patients[28-30]. In addition, implementation of the Pharmacotherapy Follow-Up service by the Clinical Pharmacy Service through the Pharmacotherapy Follow-up Form in ICU (Annex 3), together with the multidisciplinary team and the implementation of the FASTHUG methodology adapted for the ICU-Adults in the checklist format and applied in daily multidisciplinary visits, ensured that interventions were carried out.

Conclusion

Using the methodology based on FASTHUG provided standardization in the language of the care items for a critically-ill patient in a broad and multidisciplinary way, as well as a methodical and daily review of the medical records, in a comprehensive way and with higher quality. Bearing in mind that the presence of a clinical pharmacist is indispensable for reducing prescription errors, as well as for pharmacotherapy optimization, there is an evident need for a new future study evaluating the possible increase in the number of pharmaceutical interventions, comparing it with the total number of interventions performed prior to the research.

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Collaborators

Souza, AJ: writing of the article and data analysis; Banhuk, FW: data analysis and critical review; Almeida, A: data tabulation and critical review; Groll, SV: relevant critical review of the intellectual content and structural organization; Sanches, AC: review and correction of the intellectual content; Caldeira, LF: data analysis and interpretation, correction and approval of the final version.

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Conflict of interests

The author declares that there are no conflicts of interests in relation to this article.

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