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Pharmaceutical care in Stress Ulcer Prophylaxis in an Emergency Care Unit: a pharmacotherapeutic and cost-effective approach

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Abstract

Objective: To describe the importance of the pharmaceutical clinical service in redirecting the use of omeprazole for the prevention of stress ulcers in patients hospitalized in an emergency care unit. **Methods:** Descriptive study for the analysis of medical prescriptions with reference to the use of the drug omeprazole, carried out in an Emergency Care Unit, located in the state of Pernambuco, with patients hospitalized in the observation wards of this unit. The medical records of the patients were analyzed, where the need to use omeprazole was verified based on the presence or absence of conditions that justified its employability, and pharmaceutical interventions and corrections were carried out with the medical team, when necessary. Data were analyzed using descriptive statistics. Project approved by the Ethics and Research Committee with human beings (CAAE 29594620.6.30015201) of the Federal University of Pernambuco. **Results:** Fifty-four patients with a mean age of 41±11 years, predominantly male, participated in the study. 92% of these patients required pharmaceutical interventions related to omeprazole and stress ulcer prophylaxis. Of the interventions performed, about 78% were attended, which resulted not only in the therapeutic optimization of patients, but also in a pharmacoeconomy that reverberated throughout the unit, favoring a cost reduction of US\$ 3490,65. The amount saved was analyzed by comparing unit expenditures with omeprazole over a period of 12 months, 6 without pharmaceutical intervention, 6 with therapeutic optimization. **Conclusion:** The pharmacist's role in patient care configures better medication practices and significant reductions in hospital costs.

Keywords: Proton pump inhibitors, Omeprazole, pharmaceutical care, pharmacoeconomics.

Cuidado farmacêutico na Profilaxia da Úlcera de Estresse em uma Unidade de Pronto Atendimento: uma abordagem farmacoterapêutica e de custo-utilização

Resumo

Objetivo: Descrever a importância do serviço clínico farmacêutico no redirecionamento do uso do omeprazol para a prevenção da úlcera de estresse em pacientes internados em uma unidade de pronto atendimento. **Métodos:** Estudo descritivo para análise de prescrições médicas com referência ao uso do fármaco omeprazol, realizado em uma Unidade de Pronto Atendimento, localizada no estado de Pernambuco, com pacientes internados nas alas de observação desta unidade. Os prontuários dos pacientes foram analisados, onde se verificou a necessidade do uso do omeprazol com base na presença ou ausência de condições que justificassem sua empregabilidade, sendo realizadas intervenções farmacêuticas e correções junto a equipe médica, quando necessário. Os dados foram analisados através de estatística descritiva. Projeto aprovado pelo Comitê de Ética e Pesquisa com seres humanos (CAAE 29594620.6.30015201) da Universidade Federal de Pernambuco. **Resultados:** Cinquenta e quatro pacientes com idade média de 41±11 anos, predominantemente do sexo masculino participaram do estudo. 92% destes pacientes precisaram de intervenções farmacêuticas relacionadas ao omeprazol e profilaxia das úlceras de estresse. Das intervenções realizadas, cerca de 78% foram atendidas, o que culminou não apenas na otimização terapêutica dos pacientes, mas também em uma farmacoeconomia que reverberou em toda unidade favorecendo uma redução de custo de US\$ 3490,65. O valor economizado foi analisado comparando os gastos da unidade com o omeprazol por um período de 12 meses, 6 sem a intervenção farmacêutica, 6 com otimização terapêutica. **Conclusão:** A atuação do farmacêutico no cuidado do paciente configura melhores condutas medicamentosas e reduções significativas de custos hospitalares.

Palavras-chaves: Inibidores de bombas de prótons, Omeprazol, atenção farmacêutica, farmacoeconomia.



Introduction

Proton pump inhibitors (PPIs) are medications used in the clinical practice with a wide range of application. Their main indications are for the treatment of gastro esophageal reflux disease, esophagitis and peptic ulcers. The PPIs act in the body by reducing stomach gastric secretion and, therefore, they are used as gastric protectors in situations of gastric hyper secretion, duodenal ulcer, Barrett's esophagus, and upper digestive hemorrhage (UDH), gastroesophageal reflux disease (GERD). Gastric ulcers are generally caused by excessive use of anti-inflammatories and stress, for example. The pharmacotherapy related to dosage and time of administration are in accordance with the clinical condition of patient (Table 1)¹⁻⁷.

Table 1. Main clinical indications for the chronic use of PPIs.

Clinical condition	Treatment with PPIs	Bibliographic references
GERD	4 - 8 weeks in single or double dose.	Haastrup et al., 2021 ¹²
UDH	2 weeks in single or double dose after endoscopic approach	Laine et al., 2021 ¹³
Barrett's esophagus	Continuous use in a single dose.	Shaheen et al., 2016 ¹⁴
Ulcer due to NSAIDs	8 weeks in single or double dose	Khan; Howden, 2018 ¹⁵

Stress ulcers are clinical conditions in which the patient develops gastro duodenal wounds after being subjected to stressful situations in the body, such as septic shock or burns, for example⁸. The Guidelines of the Portuguese Society of Intensive Care for Stress Ulcer Prophylaxis (SUP) in Intensive Care units describe the clinical conditions for the use of PPIs⁹.

Like any other class of medication, PPIs induce unpleasant adverse events such as headache, dizziness and even interstitial nephritis in more severe cases. Such events depend on the dose and frequency of administration. In cases of chronic use, they may cause unwanted adverse effects¹⁰. Recent studies describe a reduction in calcium absorption and, consequently, in bone mineral density, as well as an increased risk of bone fractures in adults, gastric cancer and a significant increase in the prevalence of community-acquired pneumonia in aged patients¹¹⁻¹⁴. This class of antiulcer drugs has a wide therapeutic window, which makes them well tolerated in high doses, with no evidence in the literature of acute intoxication due to their use¹⁵.

In the SUP context, pharmaceutical professionals are essential in defining a pharmacological course of action to each patient. The aim of these professionals is to prevent the emergence of stress ulcers as well as to reconcile the medications prescribed¹⁶. Nunes et al.¹⁷ (2008) showed that therapeutic supervision by a pharmacist minimizes errors related to inadequate treatment duration, incorrect dose, incorrect medication and inadequate pharmaceutical form, in addition to pointing out problems that were not treated, but that required therapy.

The objective of the current study is to describe the pharmaceutical clinical service related to redirection of omeprazole use for the prevention of stress ulcers in patients admitted to an emergency care unit. The product of this action led to the prevention of unwanted events and the reduction of financial costs for the unit.

Methods

This is a longitudinal study conducted from July to December 2020 in a Type III Emergency Care Unit from the city of Jaboatão dos Guararapes, Pernambuco, Brazil. The unit acts as the population's first contact with the urgency and emergency services, admitting patients for later transfers when high-complexity services are required. A total of 197 patients were included, selected by convenience sample, who were monitored and received pharmaceutical care through anamnesis and pharmaceutical semiology, medication reconciliation and mainly prescription analysis, the latter being the key pillar for the design and result of the current study. Patients between 18 and 65 years old, not pregnant women and admitted to the observation/hospitalization wards of the Emergency Care Unit where the study was carried out were included. All participants signed the Free and Informed Consent Form duly approved by the Committee of Ethics in Research with Human Beings (CAAE 29594620.6.30015201).

All the information was collected through the physical records arranged in the respective hospitalization wards corresponding to each patient. Personal and clinical data and prescriptions were extracted, which were analyzed daily until the participants' outcomes. The patients were stratified according to their sociodemographic profile, taking into account gender, age, comorbidities and clinical factors that justified the use of proton pump inhibitors.

The prescription analysis was performed using the Drugs.com app (<https://www.drugs.com/>), Micromedex® (<https://www.micromedexsolutions.com/>) and informative literature (scientific articles indexed in the SciELO, Science Direct and BVS databases), as well as using as a basis the Guidelines of the Portuguese Society of Intensive Care for Stress Ulcer Prophylaxis in Intensive Care units, published in its 1st edition in 2019⁹, for being the most up-to-date scientific document with significant and robust evidence during the study period.

To carry out a concise analysis of the prescription in order to previously identify problems related to omeprazole use, the researchers used as a basis the diagnostic hypothesis(es), medical evolution, prescriptions, Nursing actions involving the medication in question, analysis and interpretation of laboratory tests (coagulogram, blood count, liver and kidney enzymes) and data collected during semiology and pharmaceutical anamnesis. Based on these data collected from medical records (diagnoses, comorbidities and laboratory tests), the researchers identified which patients had an indication for omeprazole use, in the SUP context.

The pharmaceutical interventions performed were classified and divided into direct and indirect. The direct interventions were those in which there was a direct approach and discussion with the prescribing professional, where inclusion or suspension of Omeprazole was recommended, supported by the patients' clinical condition. In the case of the patients who used omeprazole, the dose administered was the one recommended by the unit's guideline: 1 ampoule (40 mg) diluted in 10 mL of distilled water, intravenously every 24 hours. On the other hand, the indirect interventions included collective approaches, namely: lectures, training and pharmaceutical education, aiming to elucidate for the assistance team means of optimizing the patients' pharmacotherapy management, in the different hospital contexts, including SUP. The outcomes of the interventions were as follows: preventing a disease (stress ulcer) or symptom



(gastrointestinal bleeding) or preventing an event (adverse effects related to inappropriate omeprazole use: potential drug interactions, side effects).

Acceptability of the interventions was assessed through the execution of the suggested pharmacotherapeutic alterations, namely the inclusion of omeprazole if the patient had it or exclusion of the medication. For the interventions whose recommendation was to include omeprazole, we considered the presence of at least 1 major risk factor (coagulopathy, respiratory failure, traumatic brain injury, traumatic spinal cord injury, burn injury or sepsis) or at least 2 lower risk factors (acute or chronic renal failure, shock of any etiology, chronic liver failure, glucocorticoid therapy or multiple trauma). In turn, for those whose recommendation was to exclude the medication, absence of the mentioned risk factors was considered.

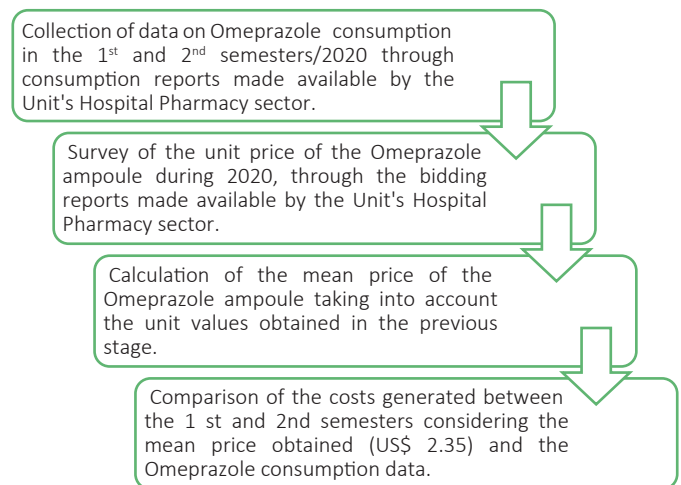
To measure the savings arising from the interventions performed, the costs generated with the Omeprazole prescription were taken into account. These were analyzed comparatively between the first semester (period before the study) and the second semester (study period) of 2020 (Figure 1). It is noteworthy that only the ampoule value was taken into account. The costs of the medical supplies used in administering the medication were disregarded, as well as the professionals' labor. The dollar exchange rate used for cost calculations was R\$ 5.65. The data obtained by the research were analyzed in Microsoft Excel® and statistically analyzed through absolute frequency, relative frequency, arithmetic mean and standard deviation tests.

Results

The study population consisted of all patients who met the initial inclusion criteria, totaling 197 subjects. They had their medical records analyzed, integrating the study sample with those who had omeprazole in their prescription or had one of the clinical conditions for SUP, excluding repetitions. After analysis, 54 patients were included (Figure 2), predominantly male and with a mean age of 41±11 years old (Table 2).

The patients prescribed with omeprazole by the medical team, 84% of them did not fit SUP. Therefore, pharmacotherapies

Figure 1 . Omeprazole monthly cost in 2020.



adjusted were conducted by suspending omeprazole. However, patients prescribed with NSAID dual therapy (56%), sepsis (25%) and thrombocytopenia (13%) with NSAID duplicity were the most related to the pharmaceutical interventions (Table 2).

Of the patients monitored in the study, 92% required pharmaceutical interventions. The medical team accepted 78% of the interventions performed by the pharmacy team (Table 2). The percentages were based on the total number of patients compared to the number of patients who presented the analysis variables. In relation to the so-called indirect interventions, educational actions were carried out with the medical and nursing teams in a timely and continuous manner (Table 3).

Another important point of this study was the cost-utilization analysis of omeprazole use during the intervention period, when compared to its use prior to the pharmaceutical interventions. The costs related to omeprazole use were analyzed for a 12-month period: from January to June 2020 without therapy optimization by pharmaceutical interventions and from July to December 2020 with therapeutic optimization by the pharmaceutical team. The analysis was comparative between the months.

Table 2. General information on the number of prescriptions accepted by the medical team according to different demographic conditions and number of prescriptions accepted in the clinical conditions for SUP where omeprazole was prescribed.

Information	All	Intervention (%)		
		Necessary	Accepted	Not accepted
Sociodemographic				
Male gender ¹ n (%)	52 (103 patients)	60 (62 patients)	93 (57 patients)	7 (5 patients)
Female gender ¹ n (%)	48 (94 patients)	56 (53 patients)	53 (29 patients)	47 (27 patients)
Age (years old) Mean (SD)	41±11			
Clinical conditions for SUP where omeprazole was prescribed² n (%)				
Dual anti-inflammatory therapy	9 (18 patients)	100 (18 patients)	89 (16 patients)	11 (2 patients)
Sepsis	5 (10 patients)	80 (8 patients)	50 (4 patients)	50 (4 patients)
Thrombocytopenia	2 (4 patients)	100 (4 patients)	100 (4 patients)	0
Other causes	1 (2 patients)	100 (2 patients)	100 (2 patients)	0
Outcomes				
Disease or symptom prevention			84 (45 patients)	
Event prevention			16 (9 patients)	
Total			78	22

Figure 2. Patient sampling flowchart.

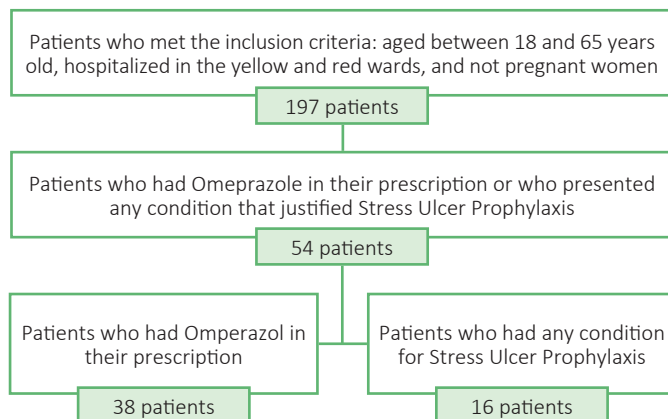


Tabela 3. Perfil de intervenções indiretas realizadas

Intervention	No. of interventions	Target population	Modality
Lecture	3	Physicians Nurses Nursing technicians	Specific
Training	3	Physicians Nurses Nursing technicians	Specific
Pharmaceutical education	Varied	Physicians Nurses Nursing technicians	Continuing

The reduction in omeprazole-related hospital costs with pharmaceutical optimization was US\$ 3,490.65. Taking into account the half-yearly consumption, which was US\$ 4,335.75 in the first semester and US\$ 845.10 in the second semester, the pharmaceutical interventions provided 81% savings in the emergency care unit (Figure 3). In addition, by implementing the clinical pharmacy service during the 24 hours of care unit, the cost reduction with omeprazole would be approximately 4 times higher than the value obtained in the study.

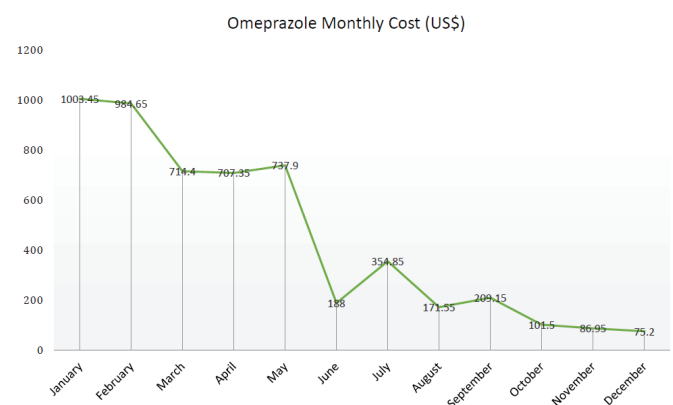
Discussion

The clinical pharmacy and pharmaceutical care practice has become increasingly common in health settings. Pharmaceutical professionals not only have made a major contribution to the treatment of patients but they also optimized costs in hospitals and clinics.

In the current study, more than 80% of the patients monitored needed adjustments to their prescriptions. Another point raised by the study is the acceptability of pharmaceuticals analyses of the prescription of patients by medical team. Here, 78% of the pharmaceuticals outcomes were respected. Comparing to similar literature, the variation in the acceptance of pharmaceuticals analysis correspond to a range between 64.2% and 96.2%¹⁸⁻²⁰.

The percentage of rejections may reflect the lack of specific clinical knowledge, the lack of trust in pharmaceutical decision, and work routine habits such as prescription based repetition with the lack of reanalysis and updating and exhausting workdays (findings consistent with study by Dias et al. 2019)²⁰.

Figure 1. Omeprazole monthly cost in 2020.



Other relevant point that corroborated indiscriminate omeprazole prescription in the observation wards was the use of previously prepared prescriptions. They had omeprazole as a fixed protocol. The prescribers' mistaken reasoning for the use of proton pump inhibitors was more related to Stress Ulcer Prophylaxis, repeating the evolution and the prescription from the previous day without paying attention to possible adjustments in therapeutic follow-up.

All these problems culminate in prescription errors that can be corrected or prevented. However, if they are not corrected, they may have severe consequences for the patients. A number of studies on pharmaceutical evaluation in hospital services state that prescription errors are the main causes related to adverse events and prolonged hospitalization with irreversible harms, higher hospital costs and even patients' deaths as outcomes of these iatrogenic events^{21,22}.

A study carried out by Reis et al. (2013)²³ corroborates the aforementioned facts. It points out prescription errors as the main drug-related problem. It reports that pre-defined drugs for the treatment of certain clinical conditions, such as omeprazole for SUP, as well as prescribers' inattention when prescribing, contribute to avoidable errors going unnoticed if there is no pharmaceutical intervention. In other words, asserting the importance of the pharmaceutical act as a barrier to the occurrence of DRPs.

As proposed by Mendes et al. (2019)⁹, there are several conditions under which protocols for SUP must be adopted. In this study, these conditions were described based on the level of scientific evidence with the most robust ones described in Table 2. In all optimized prescriptions where omeprazole was prescribed, no patient had any clinical condition for SUP.

Another condition that justifies omeprazole use in Stress Ulcer Prophylaxis is the use of NSAIDs in therapeutic duplicity, as the emergence of peptic ulcers due to intense use of this class of anti-inflammatory drugs is already well established in the literature²⁴. In none of the patients involved in the study, with hospitalization times equal to or greater than 3 days and who had duplicate NSAIDs in their prescription (Dipyron + Ketoprofen), was there an omeprazole prescription for the prevention of gastroduodenal ulcers caused by exacerbated use of NSAIDs. Thus, the intervention was required in all patients with this prescription profile.

It was also noticed that pharmacoconomics is one of the favorable consequences arising from the pharmaceutical interventions carried out, due to close, cohesive and empathetic pharmaceutical care. Correlating pharmaceutical care and pharmacoconomics,

a study with HIV-positive patients involving the pharmacists' clinical duties states that, for every US\$ 0.17 invested in therapeutic follow-up per patient, US\$ 0.29 in savings²⁵ are obtained. Another study taking into account the economic impact of the pharmaceutical clinical service, points out the effect of pharmaceutical interventions and of rational medication use, in a study carried out with antimicrobials, where US\$ 3,043.24 in savings were found through pharmaceutical care²⁶.

A high turnover of patients and an absence of an institutional protocol for SUP were observed in this study. This fact corroborates with the expressive number of interventions carried out.

As for the limitations, one can mention the absence of sample calculation, as convenience sampling was used due to the characteristics of the study locus already mentioned, making it impossible to extrapolate the results presented.

However, this study strengthens the decisive role of the pharmaceuticals professional for patients care and for the pharmacoconomics of a health institution. We observed a range of US\$ 4,123.25 reduction in hospital costs after analyzing only omeprazole prescriptions. One must assume that an opportunity for pharmaceutical care in other sections may guarantee health assistance and economical balance in health institutions.

Conclusion

The present study addressed the pharmaceutical care regarding Stress Ulcer Prophylaxis in an emergency care unit.

More than 70% of the patients enrolled in this study needed pharmacotherapeutic adjustments in their medical prescriptions to direct an optimal drug management and avoid unfavorable outcomes for the patients. In addition, pharmaceutical optimization reduced by 81% the unnecessary costs for the unit. Thus, the inclusion of a pharmacist in the clinical monitoring of patients not only guarantee optimized therapies with a reduction in unfavorable events arising from pharmacotherapy but also leads to a significant reduction in hospital costs resulting from drug therapy, enlightening the prognoses for patients and favoring the management of costs and hospital resources.

In a scenario where medication costs are overpriced and multiprofessional care is on the rise, the present study show the impact of acceptance and collaboration on the part of the medical and nursing team with pharmaceutical care, demonstrating the urgency of implementing clinical pharmacists in these services. The impacts went beyond direct patient care; they also significantly minimized costs and economic losses.

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Collaborators

Lima, MN: Project design and analysis, data interpretation and writing of the article.

Rosa, MM: Project design and analysis, data interpretation and writing of the article.

Declaration of conflict of interest

The authors declare that there is no conflict of interest regarding this article.

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