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Implementation of Pharmaceutical Care in Geriatrics: Strategies Adopted and Experiences Acquired

Implantação do Cuidado Farmacêutico na Geriatria: Estratégias Adotadas e Experiências Adquiridas

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ABSTRACT

Objectives: To describe the steps, strategies adopted, and experiences accumulated during the implementation of pharmaceutical care in a geriatric ward**. Method:** A descriptive mixed-methods study was proposed, carried out in three planned stages for the implementation of pharmaceutical care (medication reconciliation, medication review, and pharmacotherapeutic follow-up) in a geriatric ward at the University of São Paulo Hospital. In the first stage, a scoping review was conducted using the EMBASE, Web of Science, and PubMed databases. The second stage consisted of developing a situational diagnosis of the ward and adjusting procedures. The third stage comprised an intervention method aimed at identifying and resolving drug-related problems and analyzing associated clinical outcomes**. Results:** In the first stage, after screening 3,640 articles on pharmaceutical interventions in geriatrics, 35 were included in the review. The interventions frequently used the STOPP/START criteria and the Beers criteria. The main barriers were the lack of specific training and restrictions on service continuity. This stage provided scientific support for project development. In the second stage, the situational diagnosis addressed the ward's structure and epidemiological profile. Pharmaceutical services were validated by a multidisciplinary team and well accepted. In the third stage, 88% of patients had at least one PRP, with an average of 1.4 PRPs per patient. The acceptance rate of pharmaceutical recommendations was 85%. **Conclusion:** The planned method was effective in implementing pharmaceutical care, with the creation of informative materials and evidence-based strategies. Considering the context of geriatric wards, this initiative stands out as an innovation in a Latin American country and can serve as a model for similar initiatives.
Keywords: Aged; Geriatrics; Person-Centered Care; Patient safety; Pharmaceutical Services; Pharmaceutical care

RESUMO

Objetivos: Descrever as etapas, as estratégias adotadas e as experiências acumuladas durante a implantação do cuidado farmacêutico em uma enfermaria de geriatria. **Método:** Foi proposto um estudo de métodos mistos, descritivo, executado em três etapas planejadas para a implantação do cuidado farmacêutico (reconciliação de medicamentos, revisão da farmacoterapia e acompanhamento farmacoterapêutico) em uma enfermaria geriátrica do Hospital da Universidade de São Paulo. Na 1ª etapa, realizou-se uma revisão de escopo utilizando as bases EMBASE, Web of Science e PubMed. A 2ª etapa consistiu na elaboração do diagnóstico situacional da enfermaria e adequação dos procedimentos. A 3ª etapa compreendeu um método de intervenção visando identificar e resolver problemas relacionados à farmacoterapia (PRF). **Resultados:** Na 1ª etapa, após a triagem de 3.640 artigos sobre intervenções farmacêuticas em geriatria, 35 foram incluídos na revisão. As intervenções frequentemente usaram os critérios STOPP/START e os critérios de Beers. As principais barreiras foram a falta de treinamento específico e restrições à continuidade do serviço. Esta etapa forneceu embasamento científico para o desenvolvimento do projeto. Na 2ª etapa, o diagnóstico situacional abordou a estrutura da enfermaria e o perfil epidemiológico. Os serviços farmacêuticos foram validados por uma equipe multiprofissional e bem aceitos. Na 3ª etapa, 88% dos pacientes apresentaram pelo menos um PRF, com média de 1,4 PRF por paciente. A taxa de aceitação das recomendações farmacêuticas foi de 85%. **Conclusão:** O método planejado foi efetivo na implantação do cuidado farmacêutico, com a criação de materiais informativos e estratégias baseadas em evidências. Considerando o contexto de enfermarias de geriatria, destaca-se como uma inovação em um país da América Latina e pode servir como modelo para iniciativas semelhantes.
Palavras-chave: Idosos; Geriatria; Cuidado Centrado na Pessoa; Segurança do Paciente; Assistência Farmacêutica; Cuidado Farmacêutico

Introduction

Population aging is a global phenomenon, and it is projected that by 2030, one in six people will be aged 60 years or older. This demographic growth implies an increasing demand for adequate and personalized health care, especially due to the complex health conditions and multimorbidity that frequently affect this age group.[1,2]

As a consequence, medication use becomes intensive, often leading to polypharmacy, defined as the concomitant use of five or more medications.[3] This situation may pose additional risks, particularly when unnecessary drugs remain part of the individual's pharmacotherapy regimen.[4] Polypharmacy and problems associated with inappropriate medication use represent a significant challenge to patient safety and are widely recognized by global health safety campaigns.[2]

In this context, pharmaceutical care[5] has been extensively studied and applied as an effective strategy to optimize medication use and minimize risks in geriatric populations.[6] The pharmacist's role is highly relevant, as they actively participate in pharmacotherapy management, collaborating with other healthcare professionals, caregivers, and patients.[7] This involvement promotes targeted interventions to ensure that patients receive appropriate medications, in the correct doses and for suitable indications, maximizing therapeutic benefits and achieving desirable clinical outcomes.[5,7]

The pharmacist's contribution goes beyond solving drug-related problems (DRPs), encompassing the continuous monitoring of patients' clinical outcomes, which helps build robust evidence on the effectiveness of these practices within health systems.[8,9]

The implementation of pharmaceutical care in geriatric hospital units represents a person-centered and holistic approach, essential to address the individual needs of elderly patients and to strengthen the integration among different professionals involved in their care.[10,11] Therefore, it is crucial to assess the stages and experiences gained during this implementation process to identify barriers, facilitators, and effective strategies that can guide the consolidation of pharmaceutical care in geriatrics.

Thus, this study aims to describe the stages, strategies, and experiences accumulated during the implementation of pharmaceutical care in a geriatric ward. Moreover, it seeks to contribute to strengthening this practice and to promote its recognition as an integral component of elderly health care.

Methodology

Study Design

This is a mixed-methods, descriptive study conducted with the objective of developing a manual for the implementation of pharmaceutical care in geriatric wards, organized into specific stages. This project was part of a doctoral thesis at the School of Pharmaceutical Sciences of Ribeirão Preto, University of São Paulo (FCFRP-USP).

The activities were carried out between January 2019 and December 2022 in the Geriatrics Ward of the Clinical Hospital of the Ribeirão Preto Medical School (HCFMRP), University of São Paulo (USP). The study was approved by the Research Ethics Committees (CEP) of FCFRP-USP and HCFMRP-USP (CAAE: 99298718.1.0000.5403 and 99298718.1.3001.5440, respectively). The project was registered in the Brazilian Clinical Trials Registry (ReBEC; registration number: RBR-34f2px4).

Stages of the Implementation Process of Pharmaceutical Care in the Geriatrics Ward

Stage 1: Literature Review

The first stage consisted of a scoping review aimed at mapping previously published experiences and strategies related to pharmaceutical care in geriatric wards.

The search was performed in the EMBASE, Web of Science, and PubMed databases, using the descriptors "Ward" AND "Geriatrics" AND "Pharmaceutical care." The complete search strategy is available in Supplementary Material 1.

The methodology followed the guidelines of the Joanna Briggs Institute (JBI)[12] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRIS-

MA-ScR)[13], ensuring a rigorous data screening and analysis process.

Articles published up to December 2022 were included. Screening, eligibility assessment, data extraction, and analysis were independently conducted in pairs by trained researchers.

Stage 2: Situational Diagnosis and Procedure Adaptation

In this stage, a situational diagnosis was carried out to understand the physical and functional structure of the geriatrics ward and the epidemiological profile of hospitalized patients. This diagnosis supported the adaptation of the service protocol, considering the specific needs of both the study environment and the target population.

Additionally, based on the findings of the scoping review (Stage 1), the practices and tools to be implemented in pharmaceutical care were defined.

Stage 3: Service Implementation and Outcome Measurement

The third stage involved monitoring the intervention process. The main objective was to identify and resolve DRPs,[7] encompassing issues of need/indication, adherence, safety, and treatment effectiveness.

For each identified DRP, a specific pharmaceutical recommendation was proposed, discussed, and, when approved, implemented by the multidisciplinary team of the geriatrics ward. Moreover, in accordance with the principles of person-centered care, patients and caregivers were informed about and agreed with all health interventions.

The acceptance rate of recommendations was calculated based on adherence to the suggested interventions. Recommendations were validated only after confirmation of implementation, and pharmacotherapeutic follow-up was conducted to assess patients' progress.

Patients aged 60 years or older who provided informed consent, were hospitalized in the geriatrics ward for at least 48 hours, and were included in pharmaceutical care practices were eligible for inclusion in the study.

Data Analysis

Descriptive analysis of the study variables was performed, presenting absolute and relative frequencies for categorical variables and the mean accompanied by standard deviation for continuous variables.

Results

Stage 1: Scoping Review

The exploration of bibliographic databases resulted in a total of 3,640 references, of which 35 studies were deemed suitable for inclusion in this review (Figure 1). Considering our search strategy and its limitations, no studies conducted in Latin America were identified; most were carried out in Belgium. Detailed characteristics of the included studies are available in Supplementary Material 1.

Figura 1. Fluxograma do processo de seleção e inclusão dos estudos.

Across the analyzed works, the most frequently reported pharmaceutical interventions included: (I) pharmacotherapy review,[14,15] (II) medication reconciliation,[16,17] (III) patient counseling[16], (IV) detection of adverse drug events[18]; and (V) participation in multidisciplinary ward rounds[19].

Among the evaluation tools identified, the most prominent were the STOPP (Screening Tool of Older Persons' Prescriptions) and START (Screening Tool to Alert to Right Treatment) criteria[18]. The STOPP tool serves as a screening instrument to identify potentially inappropriate medications (PIMs) in older populations, while the START tool helps detect prescription omissions.[20]

The use of the Beers Criteria was also highlighted.[15] This instrument contributes to identifying PIMs and assessing drug-drug interactions, anticholinergic burden, and the need for dosage adjustments according to renal function.[21] Another tool frequently applied in the studies was the **Medication Appropriateness Index (MAI)**[22], used to assess the appropriateness of prescriptions by healthcare professionals and to analyze patients' self-medication practices.

Among the main barriers identified in the reviewed studies were the time required for implementation of planned actions, which was exacerbated by a shortage of available pharmacists.[23] The lack of hospital management support often resulted in the reassignment of pharmacists to other duties, compromising the time dedicated to clinical and patient-centered practice.[19]

Continuity of the service was also a major challenge, as post-intervention follow-up was often unfeasible due to the absence of trained personnel. Discontinuity in care transitions hindered communication with professionals in other care settings, such as primary health care.[24]

Another obstacle was the disregard of pharmacists' recommendations by physicians, with one study[25] reporting that 61% of proposed interventions were not implemented because they were overlooked by the medical team. Conversely, another study[26] found that 84% of physicians working in geriatric wards reported improvements in service quality resulting from pharmaceutical interventions.

A proposed strategy to ensure the effectiveness of pharmaceutical care implementation was the early-stage dissemination of the project among the existing ward team.[27] This approach aimed to optimize communication, inform staff about the new procedures to be introduced, and allow everyone to contribute suggestions regarding the practices to be implemented. Additionally, conducting an initial pilot period, including training and capacity-building activities focused on the tools to be used and on developing pharmacists' skills, proved to be a promising strategy for successful implementation.[27]

Stage 2: Situational Diagnosis and Procedure Adaptation

The situational diagnosis enabled an understanding of the ward's structure and the epidemiological profile of the patient population.

The ward had 16 beds dedicated to individuals aged 60 years or older, commonly affected by conditions associated with the physiological changes of aging. During the COVID-19 pandemic period (2020-August 2022), the ward's structure was reorganized to meet the increasing demand of patients affected by the SARS-CoV-2 virus, and geriatric beds were temporarily relocated. This restructuring impacted the continuity and sample size of the study, directly influencing the implementation process of pharmaceutical care.

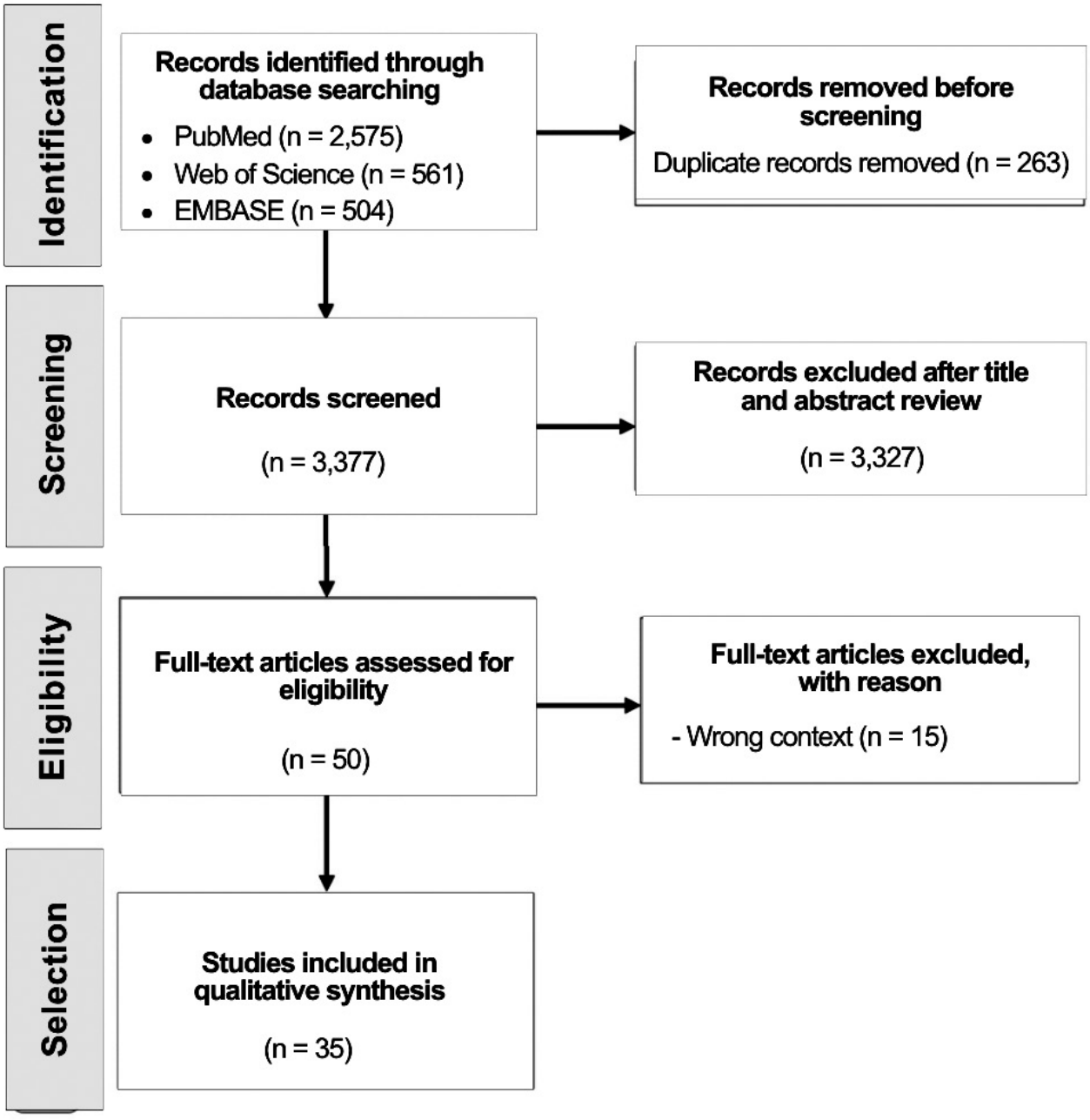
The ward's multidisciplinary team included attending and resident physicians, nurses, nutritionists, psychologists, physiotherapists, and occupational therapists, with access to computers, electronic medical records, and evidence-based health information databases. The environment thus provided an adequate structural foundation for establishing an integrated pharmaceutical care program.

Based on the positive experiences identified in the scoping review, the first stage of implementation included a six-month pilot period, led by the responsible pharmacist, focusing on team training and skill development. During this period, the pharmacist, together with the project team, engaged with the ward's leadership, including the heads of the general internal medicine and geriatrics divisions, as well as the attending physician on duty. The project was presented in detail, with support materials such as pamphlets to facilitate understanding and dissemination, and opportunities were provided for feedback and improvement suggestions.

Following approval, the project and its stages were presented at multidisciplinary team meetings in geriatrics to ensure comprehension of the new practices and to establish partnerships for implementation. Moreover, this initial phase allowed familiarization with the work environment, institutional policies, and ward routines, integrating the pharmacist into the clinical workflow.

Pharmaceutical care actions in geriatrics were outlined in two main dimensions: (1) the clinical-assistance dimension, including medication reconciliation, pharmacotherapy review, and pharmacotherapeutic follow-up; and (2) the technical-pedagogical dimension, encompassing educational initiatives to promote the rational use of medicines among patients, families/caregivers, and healthcare teams. These actions were systematically described to facilitate their execution and evaluation (Figure 2).

Figura 2. Planejamento das ações do cuidado farmacêutico a serem realizadas na geriatria.



To optimize pharmacotherapy review, screening, and the identification and resolution of drug-related problems (DRPs), several evidence-based reference tools were selected, including: DynaMed®, Micromedex®, UpToDate®, Beers Criteria,[21] STOPP/START Criteria,[20] and the World Health Organization-Uppsala Monitoring Centre (WHO-UMC) causality assessment categories for adverse drug reactions.[28] Therapeutic protocols and clinical practice guidelines based on the best available evidence (e.g., hypertension, dyslipidemia, and diabetes management guidelines, among others) were also employed to support clinical decision-making.

Pharmacist recommendations were documented in the electronic medical record, within a dedicated section for pharmaceutical care activities. In addition, the pharmacist maintained direct communication with physicians and participated in multidisciplinary case discussions, which facilitated the integration of proposed interventions into clinical routines.

Figure 2. Planning of pharmaceutical care actions to be performed in geriatrics.

Pharmaceutical Care Practice	When Implemented?	Objectives
Medication Reconciliation	At hospital admission, during transfers (if any), and at discharge	Comparative analysis between health records, prescriptions, and the patient's current condition. Results in obtaining a single, optimized, and adjusted medication list for safer and more effective pharmacotherapy.
Pharmacotherapy Review	At each new prescription issued during hospitalization	Evaluation of prescribed medications to identify DRPs and propose appropriate management strategies.
Pharmacotherapeutic Follow-up	During hospitalization and up to 90 days after hospital discharge	Monitoring medication-related outcomes. Strengthening the pharmacist's co-responsibility with the healthcare team and patient in the prevention, identification, and resolution of DRPs.
Health Education	Upon request from the healthcare team or based on identified patient needs	Promotion of rational medicine use by healthcare professionals and patients. Includes pharmaceutical counseling, development of educational materials, and dissemination of information on evidence-based medicine use.

If a recommendation was not accepted or an intervention had not been implemented within 48 hours of the initial contact, the pharmacist sought clarification from the team to understand the reasons for non-implementation, promoting a collaborative and continuous quality improvement approach.

The entire planning and execution process of pharmaceutical care activities was communicated to the multidisciplinary ward team through sectoral meetings, aiming to disseminate knowledge about the proposed interventions and foster contributions that could enrich the integration of pharmaceutical care within the geriatrics context.

Stage 3: Service Implementation and Outcome Measurement

In this stage, the outcomes of a random sample of 60 participants were analyzed. Most individuals were biologically female (n = 36; 60%) with a mean age of 76 years. Each patient presented, on average, six health conditions, predominantly related to circulatory system diseases (n = 85; 24%). Polypharmacy (use of ≥5 medications) was a common feature, observed in 93% of participants prior to hospitalization (Table 1).

Throughout the study, 83 drug-related problems (DRPs) were identified, with an average of 1.4 DRPs per patient. The most frequent DRPs were those related to safety (adverse effects, drug interactions, potentially inappropriate medications, and overdosing) and necessity (untreated conditions, contraindicated medications due to clinical status, unnecessary or non-indicated pharmacotherapy, and therapeutic duplication), accounting for 77% (n = 64) and 22% (n = 18) of cases, respectively.

Most DRPs were associated with drugs affecting the central nervous system (n = 36; 32%) (Table 2).

Importantly, the acceptance rate of pharmaceutical care recommendations was 85%, demonstrating the clinical team's receptiveness to pharmacist-led interventions.

Table 1. Sociodemographic and clinical characteristics of older adults included in the study (n = 60)

Characteristics	Frequency (%)
Gender	
Female	36 (60)
Male	24 (40)
Age (years)	
Mean ± standard deviation	76 ± 8
Health Problems	
Mean ± standard deviation	6 ± 3
Most prevalent conditions*	
Diseases of the circulatory system	85 (24)
Endocrine, nutritional, or metabolic diseases	57 (16)
Mental, behavioral, or neurodevelopmental disorders	45 (13)
Symptoms, signs, or clinical findings not elsewhere classified**	35 (10)
Diseases of the genitourinary system	26 (7)
Diseases of the musculoskeletal system or connective tissue	23 (6)
Diseases of the digestive system	18 (5)
Diseases of the blood and hematopoietic organs	15 (4)
Neoplasms	13 (4)
Diseases of the respiratory system	12 (3)
Diseases of the nervous system	11 (3)

SD: Standard deviation.

* Only health conditions with a prevalence greater than 3% were described.

** Signs or symptoms present at the initial encounter that proved to be transient and whose causes could not be determined.

The implementation of the service also involved the development of a series of standardized operational protocols and educational materials, now integrated into the organizational structure of the geriatric ward. These protocols included: (1) Management of Drug-Induced Acute Interstitial Nephritis[29]; (2) Tablet Splitting Procedures[30]; (3) ⋆Adverse Effects Induced by Opioid Use: How to Manage Them?*[30]; (4) Procedures for Insulin Administration[30]; and (5) Preparation of Medications for Administration via Feeding Tube[30].

Discussion

This interventional study conducted in a geriatric ward aimed to identify and resolve DRPs through pharmaceutical care, while also describing the implementation process and methods used to establish the service.

The effectiveness of pharmaceutical care has been consistently demonstrated in previous studies, showing improvements in patients' quality of life, resolution of pharmacotherapy-related problems, adjustment of clinical parameters, and reduction of treatment costs for chronic conditions such as diabetes mellitus, dyslipidemia, and systemic arterial hypertension.[31,32]

The findings of the present study reflect the collaborative work of the healthcare team and the integration of the pharmaceutical care service, suggesting that incorporating pharmaceutical care into patient management is a promising strategy for improving health outcomes. Moreover, the growing demands on health systems highlight the importance of clinical pharmacy services and health education provided by pharmacists.[33]

Previous studies[34,35] have reported a predominance of elderly women (43-73%), consistent with our sample, whose mean age ranged from 76 to 82 years.[34,35]

In terms of DRPs, other investigations[35,36] identified 329 to 595 DRPs, depending on sample size, with mean DRPs per patient ranging from 0.6 to 5.4.[35,36]

Given the growing prevalence of medication-related incidents and increasing life expectancy, suggesting that older adults will soon represent the majority of the population, this scenario signals a potential epidemic of adverse events. Understanding contributing factors and promoting preventive efforts is therefore essential.

In the present study, pharmacotherapy review included both prescription analysis and patient anamnesis, offering a more comprehensive approach to DRP identification and enhancing the overall medication assessment.

Table 2. Characterization of drugs associated with drug-related problems (DRPs) in geriatrics

Main ATC Group*	Therapeutic Class	%
Nervous system		32
	Antipsychotics	
	Opioids	
	Antidepressants (SSRIs, SNRIs, among others)	
	Antiepileptics (benzodiazepines and others)	
	Antiparkinsonian drugs (anticholinergics, dopaminergic agents)	
	Anti-dementia drugs (acetylcholinesterase inhibitors)	
Cardiovascular system		31
	Lipid-modifying agents	
	Calcium channel blockers (CCBs)	
	Agents acting on the renin-angiotensin system	
	Antiarrhythmics	
	Diuretics	
	Antiadrenergic agents	
Digestive tract and metabolism		21
	Antacids and antiulcer agents (PPIs, H_2 antagonists)	
	Antispasmodics, anticholinergics, and propulsives	
	Mineral and vitamin supplements	
	Antidiabetic drugs (insulins and oral hypoglycemics)	
	Antiemetics and antinauseants	
Blood and blood-forming organs		6
	Antithrombotic agents	
	Antianemic preparations	
Systemic hormonal preparations		4
	Thyroid therapy	
Systemic anti-infectives		2
	Macrolides and lincosamides	
	Quinolones	
Respiratory system		2
	Drugs for obstructive airway diseases (anticholinergics)	
Musculoskeletal system		2
	Antigout preparations	

Ag.: agents; Med.: medicines; SSRIs: selective serotonin reuptake inhibitors; SNRIs: serotonin-norepinephrine reuptake inhibitors; BDZ: benzodiazepines; CCBs: calcium channel blockers; PPIs: proton pump inhibitors.
* Anatomical Therapeutic Chemical (ATC) - International drug classification system.
The average hospital length of stay was 10 days, with five in-hospital deaths and two deaths within 90 days after discharge. Over the same 90-day follow-up period, 22 hospital readmissions were recorded.

Regarding DRP classification, although various studies use different systems, issues such as underdosing, lack of treatment, untreated symptoms, and incorrect dosages are consistently prevalent.[22,35] Moreover, DRPs associated with drug interactions and adverse drug reactions are common among older adults hospitalized in geriatric wards.[8,37] These findings align with those of the present study, highlighting the types of DRPs that demand pharmacists' attention in clinical evaluations.

Another study[36] emphasized patients' lack of knowledge about their pharmacotherapy, with deficiencies already present prior to hospitalization, underscoring adherence challenges.

The findings also corroborate previous evidence[8,38] indicating a higher likelihood of DRPs among polymedicated elderly patients, with unfavorable clinical impacts.

In this study, most DRPs were associated with central nervous system (CNS) medications, which,

in older adults, increase the risk of falls, fractures, and sedation-related adverse outcomes (e.g., respiratory depression). Physiological changes and functional impairments typical of this population may alter drug effects, further heightening risk.[21]

For all such cases, the geriatric team discussed each finding in light of individual patient conditions.

Adverse drug events (ADEs) remain a recurring issue in healthcare, contributing to higher patient mortality rates and ranking among the top three causes of negative health outcomes in both the United States and Brazil.[39,40] Failures in medication management consume significant public health resources, as managing preventable ADEs can account for up to 30% of healthcare costs.[40]

After identifying DRPs, pharmacists proposed specific recommendations to resolve or prevent potential harm. In this study, 85% of pharmacist recommendations were accepted and implemented, which can be attributed to two key factors: (1) interventions were considered accepted only after confirmed implementation; and (2) ongoing pharmacotherapeutic follow-up enabled continuous patient monitoring, strengthening the impact of interventions.

The World Health Organization (WHO) has emphasized the need to promote medication safety and to engage the global public health community in developing knowledge, attitudes, and tools to reduce DRPs.[2] Pharmaceutical care interventions foster the rational use of medicines, help reduce errors and prevent harm, improve clinical outcomes, and enhance patients' quality of life.

Therefore, the present study underscores the importance of sharing practical experiences and challenges encountered in implementing pharmaceutical care within health services. Depending on the clinical specialty, pharmacists must pursue ongoing professional development and specialized training to address the unique needs of specific populations, such as older adults in geriatrics. This remains a challenge in many contexts,[22,41] particularly in resource-limited settings.

In this study, the pharmacist had the opportunity to conduct a six-month pilot phase, enabling skill development and contextual understanding of geriatric practices.

Additionally, pharmaceutical care activities demand adequate time both for high-quality service delivery and for proper outcome monitoring. Previous studies have identified time constraints and a limited number of pharmacists as significant barriers to service continuity.[19,22-24,36]

Institutional support and encouragement from hospital management are crucial for pharmacists to fully dedicate themselves to clinical care, an issue frequently cited in the literature.[19,22-24,36]

Furthermore, interprofessional collaboration within the multidisciplinary healthcare team is essential for the effective implementation and continuity of pharmaceutical care.[24,25] Most interventions are conducted collaboratively, particularly involving physicians and nurses.[7]

Indeed, the acceptance of pharmacist recommendations often requires physician approval for prescription modifications. A prior study reported that 61% of pharmacist-proposed interventions were not implemented because they went unnoticed by physicians.[25]

In contrast, in this study, direct communication between pharmacists and physicians, as well as participation in multidisciplinary case discussions, facilitated the integration of proposed interventions.

Beyond quantitative outcomes, it is vital to consider the qualitative experiences gained during pharmaceutical care implementation and to identify promising strategies to overcome encountered challenges. Such an approach enhances the likelihood of success and maximizes benefits for patients.

Limitations

This study has several limitations. First, the scoping review protocol was not pre-registered, representing a methodological limitation.

Additionally, the number of interventions conducted in each phase (medication reconciliation, pharmacotherapy review, and pharmacotherapeutic follow-up) and the time required for each activity were not recorded, which limits further analysis.

Obtaining a representative sample in this population is inherently challenging, especially in prospective experimental studies, due to the complex clinical profiles of older adults in advanced stages of life.

The study was conducted in a single ward and over a specific period, which restricts generalizability. Nonetheless, the methodology used may serve as a model for implementation in other settings, with appropriate local adaptation.

Despite these limitations, this research provides a practical and comprehensive perspective on pharmaceutical care interventions. The project has since become a continuous service in the geriatric ward and currently serves as a training site for pharmacy students at the University of São Paulo's School of Pharmaceutical Sciences in Ribeirão Preto, offering opportunities for ongoing evaluation and research.

Conclusion

The proposed method proved promising for implementing pharmaceutical care in a geriatric ward, supported by the development of educational materials and evidence-based strategies.

Key steps included: (1) a literature review that provided theoretical grounding; (2) a situational diagnosis that allowed for procedural adaptation and dissemination; and (3) monitoring of interventions and indicators, demonstrating the service's contribution to improved care quality in the geriatric ward.

This initiative stands out as innovative within the Latin American context, particularly in hospital geriatrics, and may serve as a model for similar implementations. The stages designed and executed within a multidisciplinary hospital setting contributed to enhancing the safety and effectiveness of medication use among older adults.

Authors Contributions
AMO, FRV, and LRLP: Conceptualization and methodology; AMO, BFR, JPVR, FRV, and LRLP: Investigation; AMO, JPVR, MSAC, FRV, and LRLP: Formal analysis; FRV and LRLP: Supervision;AMO: Writing - original draft; AMO, BFR, JPVR, MSAC, FRV, and LRLP: Visualization, review, and editing.

Conflicts of Interest
The authors declare no financial or non-financial conflicts of interest.

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Data Availability Statement
All relevant data are included within the article.

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MATERIAL SUPLEMENTAR 1

ESTRATÉGIA DE BUSCA

Hospitals OR Hospital* OR Tertiary Care Centers OR Tertiary Care Center* OR Tertiary Referral Center* OR Tertiary Referral Hospital* OR Tertiary Hospital* OR Ward* OR Infirmar* OR Patients' Rooms OR Patients' Room* OR Patients Room* OR Patient Room* OR Patient's Room* OR Private Room* OR Semi-Private Room* OR Semi Private Room*

AND

Aged OR Aged, 80 and over OR Elderly* OR Senior* OR Old-aged OR Older people OR Older person OR Older Individual* OR Geriatrics OR Gerontology OR Health Services for the Aged OR Geriatric Health Service* OR Health Services for the Elderly OR Health Services for Aged

AND

Pharmaceutical care* OR Pharmaceutical Services OR Pharmaceutical Service* OR Pharmaceutic Service* OR Pharmacy Service* OR Pharmacy Service, Hospital OR Hospital Pharmacy Service* OR Hospital Pharmaceutical Service* OR Clinical Pharmacy Service* OR Clinical Pharmacy OR Evidence-Based Pharmacy Practice OR Evidence-Based Pharmacy Practice* OR Evidence Based Pharmacy Practice* OR Evidence-Based Pharmaceutical Care* OR Evidence Based Pharmaceutical Care* OR Evidence-Based Pharmac* OR Evidence Based Pharmac* OR Pharmacy Practice*

AND

Accomplish* OR Adopt* OR Appl* OR Arise OR Arose OR Begin* OR Deploy* OR Develop* OR Execut* OR Implement* OR Innovat* OR Integrat* OR Introduc* OR Opening* OR Origin* OR Organizational Change* OR Organizational Innovation OR Organizational Innovation* OR Performance* OR Post-deploy* OR Realiz* OR Start* OR Implementation Science OR Implementation Science*

CARACTERÍSTICAS DO ESTUDOS INCLUÍDOS NA REVISÃO DE ESCOPO

Autores, Ano; País; DOI	Objetivo	Desenho	Serviço Farmacêutico ou Intervenção Realizada conforme Descrito no Estudo
Al-Rashed et al., 2002; Reino Unido; DOI: 10.1046/j.1365-2125.2002.01707.x	Avaliar se os resumos de alta com informações e medicamentos, juntamente com a orientação farmacêutica durante a internação, apoiada por um simples cartão de lembrete de medicamentos, podem contribuir para a prestação de um cuidado farmacêutico contínuo.	Estudo de intervenção	• Resumos de alta com informações e medicamentos; • Orientação farmacêutica.
Burns et al., 1992; Reino Unido; DOI: 10.1093/ageing/21.3.178	Quando o cuidado de um idoso é transferido dos serviços hospitalares para a equipe de atenção primária, uma comunicação eficaz é essencial. Um estudo pós-alta foi realizado para avaliar a magnitude desses problemas.	Estudo de Intervenção e Acompanhamento	• Orientação farmacêutica.
Cheong et al., 2019; Singapura; DOI: 10.11622/smedj.2018153	Explorar a prevalência de prescrições inadequadas em uma coorte de pacientes geriátricos internados, avaliando a adequação dos medicamentos por meio de um algoritmo implícito de desprescrição desenvolvido por Scott et al., 2015.	Estudo transversal	• Adequação dos medicamentos.
Chiu et al., 2018; China; DOI: 10.12809/hkmj176871	Determinar se um programa de revisão de medicamentos conduzido por farmacêutico poderia reduzir medicamentos inadequados e readmissões hospitalares entre pacientes geriátricos internados em Hong Kong.	Estudo controlado prospectivo.	• Reconciliação de medicamentos; • Revisão de medicamentos; • Orientação farmacêutica.
Cornu et al., 2012; Bélgica; DOI: 10.1345/aph.1Q594	Determinar com que frequência as discrepâncias no histórico de medicamentos obtido pelo médico resultam em discrepâncias durante a internação e na alta; Determinar a influência das intervenções dos farmacêuticos clínicos nas discrepâncias e investigar possíveis determinantes relacionados ao paciente para a ocorrência de discrepâncias.	Estudo de coorte retrospectivo	• Reconciliação de medicamentos (admissão, durante a internação e na alta).
Cornu et al., 2014; Bélgica; DOI: 10.1007/s11096-014-9925-x	Comparar o desempenho de ambas as abordagens (uso de sistemas de apoio à decisão clínica e intervenções de farmacêuticos clínicos) com o principal objetivo de aprender com uma abordagem para aprimorar a outra.	Estudo de coorte prospectivo.	• Identificação de interações medicamentosas e intervenções.
de Bock et al., 2018; Bélgica; DOI: 10.3390/pharmacy6010021	Avaliar os sucessos e as barreiras na implementação de um processo completo de revisão de medicamentos conduzido por farmacêutico na enfermaria geriátrica de um hospital local na Bélgica.	Estudo de Intervenção	• Revisão de medicamentos; • Reconciliação de medicamentos; • Orientação farmacêutica.

Autores, Ano; País; DOI	Objetivo	Desenho	Serviço Farmacêutico ou Intervenção Realizada conforme Descrito no Estudo
de Oliveira et al., 2022; Brasil; DOI: 10.1590/1983-1447.2022.20210236.en	Descrever a experiência de implementação do cuidado farmacêutico em uma unidade hospitalar geriátrica e propor um protocolo instrucional para a prática.	Relato de experiência descritivo.	• Revisão de medicamentos; • Reconciliação de medicamentos; • Acompanhamento farmacoterapêutico; • Orientação farmacêutica.
Deliens et al., 2016; Bélgica; DOI: 10.1016/j.jgo.2016.05.001	Avaliar a prevalência do uso de medicamentos potencialmente inapropriados na admissão e na alta em uma unidade de oncologia geriátrica após a inclusão de um farmacêutico clínico.	Estudo prospectivo.	• Revisão completa e abrangente de medicamentos.
Delgado Silveira et al., 2012; Espanha; DOI: 10.1016/j.regg.2011.11.012	Avaliar se a integração do cuidado farmacêutico em uma unidade geriátrica aguda pode promover a identificação de prescrições potencialmente inapropriadas e eventos adversos a medicamentos, e se isso pode melhorar a informação fornecida a pacientes e cuidadores na alta hospitalar.	Estudo prospectivo descritivo.	• Programa de cuidado farmacêutico (revisão de medicamentos na admissão e orientação farmacêutica na alta hospitalar).
Egger et al., 2003; Alemanha; DOI: 10.2165/00002512-200320100-00005	Comparar a taxa de reações adversas a medicamentos prevista por um banco de dados farmacológico computadorizado com a taxa real determinada pela observação direta em uma amostra de pacientes geriátricos.	Observacional prospectivo.	• Detecção de reações adversas a medicamentos e interações medicamentosas.
Ertuna et al., 2019; Turquia; DOI: 10.2147/CIA.S201039	Definir e classificar os problemas relacionados a medicamentos (PRMs) e as intervenções farmacêuticas na enfermaria geriátrica de um hospital universitário na Turquia; Determinar os medicamentos e formas farmacêuticas mais prescritos em relação aos possíveis PRMs na população do estudo.	Análise retrospectiva.	• Revisão de medicamentos; • Rondas geriátricas interdisciplinares.
Ferro-Uriguen et al., 2022; Espanha; DOI: 10.3389/fpubh.2022.994819	Investigar se a aplicação de um modelo adaptado de prescrição centrada na pessoa reduz o número total de medicamentos regulares em idosos internados em um hospital subagudo no final da vida, melhorando os indicadores farmacoterapêuticos e reduzindo os custos associados ao tratamento farmacológico.	Ensaio clínico randomizado e controlado.	• Entrevista com o paciente ou cuidador mais próximo; • Revisão de medicamentos.
Hannou et al., 2017. Suíça; DOI: 10.1007/s11096-017-0513-8	Avaliar o impacto das intervenções do farmacêutico clínico na identificação de prescrições potencialmente inapropriadas de medicamentos.	Estudo de intervenção prospectivo.	• Revisão de medicamentos; • Reconciliação de medicamentos.
Hellemans et al., 2020; Bélgica; DOI: 10.1007/s11096-020-01091-4	Determinar se a desprescrição durante a internação esteve associada a uma menor taxa de readmissão três meses após a alta.	Estudo de caso-controle.	• Reconciliação de medicamentos; • Revisão completa de medicamentos na admissão e na alta.

Autores, Ano; País; DOI	Objetivo	Desenho	Serviço Farmacêutico ou Intervenção Realizada conforme Descrito no Estudo
Hias et al., 2020; Bélgica; DOI: 10.1080/17843286.2019.1629054	Avaliar e potencialmente melhorar o programa de farmácia clínica, obtendo o feedback dos médicos.	Estudo de questionário.	• Um questionário eletrônico anônimo foi enviado aos médicos para avaliar e potencialmente melhorar o programa de farmácia clínica (reconciliação de medicamentos, revisão de medicamentos na admissão, durante a internação e/ou na alta, resolução de questões farmacoterapêuticas baseadas no paciente e fornecimento de listas de medicamentos amigáveis ao paciente).
Hias et al., 2022; Bélgica; DOI: 10.1080/17843286.2020.1864162	Avaliar a implementação de estratégias para otimizar a farmacoterapia em unidades geriátricas na Bélgica.	Levantamento transversal.	• Reconciliação de medicamentos na admissão e na alta; • Revisão de medicamentos durante a internação; • Políticas de alta relacionadas a medicamentos; Práticas de prescrição; Educação de profissionais de saúde; Pacientes e seus cuidadores; e Envolvimento de farmacêuticos clínicos.
Hung et al., 2019; Taiwan; DOI: 10.1111/bcp.14095	Melhorar a reconciliação de medicamentos e reduzir a ocorrência de prescrições duplicadas por farmacêuticos e médicos dentro de 72 horas após a admissão hospitalar, utilizando um sistema de prescrição inteligente combinado com o sistema National Health Insurance PharmaCloud para integrar a base de dados ao sistema informatizado de prescrição médica da instituição médica.	Estudo pré/pós-intervenção.	• Reconciliação de medicamentos.
Ma et al., 2021; China; DOI: 10.1007/s11096-020-01128-8	Identificar e categorizar a incidência e as características dos problemas relacionados a medicamentos (PRMs) em pacientes idosos hospitalizados com base na classificação da Pharmaceutical Care Network Europe. Identificar fatores de risco para PRMs.	Estudo retrospectivo.	• Reconciliação de medicamentos; • Revisões de medicamentos; • Educação e aconselhamento; • Fornecimento de suporte à prescrição.
Marín-Gorricho et al., 2022; Espanha; DOI: 10.23938/assn.0990	Estimar a prevalência de prescrições potencialmente inapropriadas e problemas relacionados a medicamentos em uma unidade geriátrica aguda; Avaliar o impacto da intervenção farmacêutica na sua prevalência.	Estudo quase-experimental, intervencionista.	• Revisar a prescrição de medicamentos e o histórico médico de cada paciente.

Autores, Ano; País; DOI	Objetivo	Desenho	Serviço Farmacêutico ou Intervenção Realizada conforme Descrito no Estudo
Montaleytang et al., 2021; França; DOI: 10.1007/s11096-021-01229-y	Investigar o impacto da reconciliação de medicamentos em geriatria na sustentabilidade da otimização terapêutica após a alta hospitalar.	Estudo retrospectivo e descritivo.	• Reconciliação de medicamentos.
Mulvogue K et al., 2017; Austrália; DOI: doi:10.1111/jcpt.12489	Avaliar o efeito da inclusão de um farmacêutico em uma visita médica liderada por médicos sobre a prescrição potencialmente inapropriada em pacientes idosos hospitalizados.	Estudo de coorte observacional.	• Avaliar mudanças na qualidade da prescrição; • Participar das visitas médicas.
Nazareth et al., 2001; Reino Unido; DOI: 10.1093/ageing/30.1.33	Investigar a eficácia de um plano de alta farmacêutica em pacientes idosos hospitalizados.	Ensaio clínico randomizado.	• Serviço de alta farmacêutica.
Raimbault-Chupin et al., 2013; França; DOI: 10.1007/s11096-013-9821-9	Fazer um inventário dos problemas relacionados a medicamentos e das intervenções do farmacêutico residente na unidade de cuidados agudos geriátricos utilizando o sistema de Entrada de Ordens Médicas Computadorizadas; Avaliar a aceitação pelos médicos das intervenções propostas.	Estudo descritivo.	• Participação nas visitas médicas; • Histórico de medicamentos na admissão; • Validação das ordens de medicação.
Rhalimi et al., 2017; França; DOI: 10.1007/s40801-016-0098-x	Descrever a avaliação geriátrica abrangente do farmacêutico na admissão de pacientes idosos e avaliar sua relevância em termos de adesão à medicação e intervenções farmacêuticas.	Estudo de intervenção prospectivo.	• Avaliação geriátrica abrangente do aarmacêutico.
Sennesael et al., 2018; Bélgica; DOI: 10.1007/s11096-017-0563-y	Avaliar se a implementação de uma ferramenta de triagem (versão curta dos critérios STOPP-START) na prática geriátrica de rotina reduz os medicamentos potencialmente inapropriados e as omissões potenciais de prescrição na alta.	Análise retrospectiva de séries temporais interrompidas.	• Revisão dos tratamentos.
Somers et al., 2003; Bélgica; DOI: 10.1007/s00228-002-0535-5	Testar um método para registro de reações adversas a medicamentos que resultam em internação hospitalar e das RAMs ocorridas durante a internação hospitalar.	Estudo prospectivo.	• Entrevista com pacientes para identificação e registro de RAMs
Somers et al., 2013; Bélgica; DOI: 10.2147/CIA.S42162	Avaliar o tipo, a taxa de aceitação e a relevância clínica das recomendações do farmacêutico clínico na ala geriátrica do hospital universitário de Ghent.	Estudo observacional.	• Avaliação do uso de medicamentos durante uma visita semanal.
Spinewine et al., 2006; Bélgica; DOI: 10.1345/aph.1G515	Relatar os resultados da primeira implementação dos serviços de farmácia clínica na Bélgica, voltados para pacientes com alto risco de problemas relacionados aos medicamentos.	Estudo de intervenção.	• Cuidado farmacêutico da admissão à alta.

Autores, Ano; País; DOI	Objetivo	Desenho	Serviço Farmacêutico ou Intervenção Realizada conforme Descrito no Estudo
Stämpfli et al., 2018; Suíça; DOI: 10.1007/s40266-018-0557-z	Investigar a inclusão de entrevistas com farmacêuticos como parte das revisões de medicamentos (incluindo o uso de critérios explícitos e implícitos de prescrição inapropriada) para identificar problemas relacionados a medicamentos em pacientes idosos internados.	Estudo observacional.	• Entrevistas com farmacêuticos como parte das revisões de medicamentos.
Steurbaut et al., 2010; Bélgica; DOI: 10.1345/aph.1P192	Avaliar o desempenho do farmacêutico clínico na obtenção do histórico de medicamentos dos pacientes e na reconciliação desses dados com os registros médicos e ordens de medicação, e se a situação residencial dos pacientes antes da hospitalização influencia o número de discrepâncias medicamentosas.	Estudo observacional prospectivo.	• Reconciliação de medicamentos.
Van der Linden et al., 2017; Bélgica; DOI: 10.1007/s40266-016-0424-8	Avaliar o efeito de uma intervenção farmacêutica, consistindo na aplicação da lista de Racionalização da Medicação Domiciliar por STOPP Ajustado e uma revisão de medicamentos liderada por farmacêutico sobre a polifarmácia, a qualidade da prescrição e os resultados clínicos em pacientes geriátricos internados.	Estudo controlado prospectivo.	• Reconciliação de medicamentos; • Revisão de medicamentos.
Van der Linden et al., 2019; Bélgica; DOI: 10.1007/s11096-019-00846-y	Validar uma versão minimizada de uma intervenção anterior de farmacêuticos clínicos em um ambiente não acadêmico com recursos limitados; Comparar a redução de medicamentos potencialmente inapropriados com dois estudos de intervenção controlados anteriores.	Estudo prospectivo, controlado e com cegamento simples.	• Reconciliação de medicamentos; • Revisão de medicamentos.
Van Der Linden et al., 2021; Bélgica; DOI: 10.1080/17843286.2019.1683128	Documentar os resultados do programa de farmácia clínica implementado nas unidades de cuidados geriátricos agudos e determinar os fatores associados ao número de recomendações fornecidas na alta.	Estudo retrospectivo.	• Reconciliação de medicamentos; • Revisão de medicamentos.
Walgraeve et al., 2018; Bélgica; DOI: 10.1007/s41999-017-0019-x	Investigar o impacto da integração de farmacêuticos clínicos em uma equipe de cuidados multidisciplinar nas terapias medicamentosas de pacientes geriátricos com insuficiência cardíaca; Padronizar a intervenção farmacêutica clínica desenvolvendo um algoritmo abrangente.	Estudo prospectivo de viabilidade.	• Revisão completa dos medicamentos.