Errata/ Correction:
https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/18348

ARTIGO ORIGINAL

Medication Reconciliation During Admission to an Internal Medicine Department: A Pilot Study

Reconciliação Terapêutica na Admissão de um Serviço de Medicina Interna: Estudo-Piloto

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Acta Med Port 2022 Nov;35(11):798-806 ▪ https://doi.org/10.20344/amp.16892

ABSTRACT

Introduction: The purpose of medication reconciliation is to promote patient safety by reducing medication errors and adverse events due to medication discrepancies in transition of care. The aim of this pilot study of medication reconciliation at the time of hospital admission was to identify the necessary resources for its implementation in clinical practice.

Material and Methods: Pilot study with 100 patients admitted to an Internal Medicine department between October and December 2019, aged 18 and over, and chronically taking at least one medicine. The best possible medication history was obtained systematically, with subsequent identification, classification and resolution of the discrepancies.

Results: The study sample, in general characterized by polypharmacy and by having multiple long-term conditions, presented a mean age of 77.04 ± 13.74 years, being 67.0% male. Overall, 791 discrepancies were identified. Intentional discrepancies were 95.7% and 50.9% of them were documented. The difficulties encountered were mainly related with the access and quality of therapeutic information and communication problems between different healthcare professionals. The key priority resources that were identified were related with the process, tools, and personnel categories.

Conclusion: The data revealed weaknesses in the clinical records available at the primary/hospital care interface. Optimization of data sources, standardization and informatization of the process, multidisciplinary approach and definition of priority groups were identified as opportunities for optimization.

Keywords: Internal Medicine; Medication Errors; Medication Reconciliation; Patient Safety; Transitional Care

RESUMO

Introdução: A reconciliação terapêutica visa promover a segurança do doente por meio da redução de erros de medicação e eventos adversos decorrentes de discrepâncias de medicação na transição de cuidados. Foi nosso objetivo realizar um estudo-piloto de reconciliação terapêutica no momento da admissão hospitalar para, a partir dele, identificarmos os recursos necessários para a sua implementação na prática clínica.

Material e Métodos: Estudo-piloto com 100 doentes admitidos num serviço de Medicina Interna entre outubro e dezembro de 2019, com mais de 18 anos e a tomar cronicamente pelo menos um medicamento. A melhor história farmacoterapêutica possível foi obtida sistematicamente, com posterior identificação, classificação e resolução das discrepâncias.

Resultados: A amostra em estudo, em geral polimedicada e com múltiplas morbilidades, apresentou uma média de idades de 77,04 ± 13,74 anos, sendo 67,0% do sexo masculino. Foram identificadas 791 discrepâncias e as intencionais (95,7%) estavam documentadas em 50,9% das situações. As dificuldades encontradas relacionaram-se principalmente com o acesso e a qualidade da informação terapêutica e com a dificuldade de comunicação entre os diversos profissionais de saúde. Os principais recursos prioritários identificados relacionaram-se com as categorias de processo, ferramentas e pessoal.

Conclusão: Os dados revelaram fragilidades nos registos clínicos disponíveis na interface dos cuidados primários/hospitalares. A otimização das fontes de dados, normalização e informatização do processo, atuação multidisciplinar e definição de grupos prioritários foram identificadas como oportunidades de otimização.

Palavras-chave: Cuidado Transicional; Erros de Medicação; Medicina Interna; Reconciliação de Medicamentos; Segurança do Doente

INTRODUCTION

According to the Portuguese Directorate-General of Health (*Direção-Geral da Saúde* - DGS), medication reconciliation is defined as "the analysis of a patient's medication whenever changes occur, aimed at avoiding discrepancies, namely omissions, duplications or inadequate doses, promoting adherence to medication and contributing to the prevention of medication-related patient safety incidents",[1] having assumed particular relevance with the increase in overall life expectancy, reflected in an increasing number of elderly patients presenting with comorbidities and chronic polypharmacy.

Medication reconciliation consists of the systematised

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Recebido/*Received*: 20/07/2021 - **Aceite/*Accepted*:** 15/12/2021 - **Publicado *Online*/*Published Online*:** 04/03/2022 - **Publicado/*Published*:** 02/11/2022

assessment of all the medicines that are being added, replaced or discontinued for each patient in transitional care, which is the most vulnerable moment for errors to occur and, subsequently, the most eligible for the implementation of any prevention strategies.[2,3] As defined by Standard 018/2016 of the DGS, medication reconciliation should be promoted by Portuguese healthcare institutions, in order to standardise the form of communication between healthcare professionals and to ensure any relevant information regarding the patients and their medications.[1]

Considering an up-to-date and reliable list of any current therapeutic regimen, medication reconciliation is based on the principle that pharmacotherapeutic information is effectively transmitted in the continuity of care, and the therapeutic plan will be based on this, while it should be optimised as the clinical situation requires. This initial list, known as the best possible medication history (BPMH), provides the clinical team not only with a global therapeutic view of each patient, while also making any hospital discharge plan easier, reducing any incorrect flow of information to the healthcare services or to the patients themselves.[4]

Discrepancies can occur at the time of admission, during hospitalisation or at discharge. In a review of medication reconciliation in the patient's transition from hospital to primary care, a variation of 20 to 87% in the number of patients with discrepancies related to therapy has been found when analysing 15 studies covering 6,000 hospital discharges,[5] emphasising the need to make this information available across the healthcare system.

Despite their contribution to strengthening patient safety practices, any intervention developed and implemented in the transition of care requires effective communication of information, while involving different people, professionals, technologies, processes and departments.[6] Hospitals are still facing many challenges in the application of this tool in clinical practice, as the need for resources and integration into a pre-existing workflow requires reconciling different clinical, behavioural and organisational factors.

Therefore, the lack of clear measures and standardisation of concepts between European Union countries means that, even today, initiatives in this direction are often promoted individually and adapted from international models. Oliveira *et al.* (2020) have assessed the potential contributions of the main sources of information available in Portugal in obtaining the BPMH, aimed at deepening this knowledge at a national level and showing the relevance of electronic health records, represented by the health data platform (*Plataforma de Dados de Saúde* - PDS) in the improvement of the accuracy of therapeutic information, particularly considering a retrospective period of six months after hospitalisation.[7]

Our study involved a pilot study of medication reconciliation at hospital admission aimed at the identification of the resources required for its implementation in clinical practice.

MATERIAL AND METHODS

This was a prospective pilot study carried out between October and December 2019 at the Department of Internal Medicine in the Coimbra Hospital and University Centre (CHUC). The study was approved by the ethics committee of the same institution (CHUC-133-19) and a signed informed consent was obtained from all the participants. The first 100 patients aged over 18 and taking at least one medication at home who were admitted to the department were included in the study. Whenever an interview was unavailable, including patients unable to communicate and with no available representation by a family member or caregiver (as it happens in social cases), this was considered as exclusion criterion.

Admission to hospital was the transition of patient care that was considered in the study, as defined by the DGS, as it is the first critical point to be considered when implementing medication reconciliation in hospital care.[1]

The study was carried out in different stages:

1. Collection of sociodemographic data and general information. A specific form with the patient's sociodemographic data (gender, age, type of residence and index of activities of daily living), habits (smoking, alcohol and autonomy in medication management) and clinical conditions (comorbidities, allergies and clinical parameters). The information was collected using the patient's medical file, through different hospital apps, including the SGCIM (integrated drug circuit management system (*Sistema de Gestão Integrado do Circuito do Medicamento* – prescription module), ALERT (emergency department software - admission data, follow-up, and prescription) and *SClínico Hospitalar* (history of clinical episodes and follow-up). The patient's physical medical files were also analysed.

2. Pre-hospital pharmacotherapeutic profile and BPMH. In addition to the hospital records, the Electronic Health Record (*Registo de Saúde Electrónico* - RSE) of each patient within the Health Data Platform (*Plataforma de Dados de Saúde* - PDS) was analysed, throughout a six-month retrospective period from the date of hospital admission,[7] as well as any outpatient medical prescriptions, medication lists and bags brought in by the patient or from long-term care institutions, as well as other prescriptions, discharge plans and any updates from previous hospitalisations.

The data that were obtained were confirmed through a semi-structured interview with all the participants (patient/caregiver), carried out by the research pharmacist, considering this information as the most accurate. After comparing the data obtained in the interview with at least one of the different data sources, the BPMH was defined, allowing the identification of pre-hospital chronic medication use (name, dose, pharmaceutical form, frequency, and route of administration). All pre-hospital medications were considered, with or without a prescription, including herbal medicines and herbal teas. Any medications prescribed for a certain period whose treatment was in progress on the date of admission were also considered. The use of at least

five medications was considered as polypharmacy.

3. Inpatient prescription and identification of discrepancies. Once the BPMH had been obtained, inpatient prescriptions valid for the initial 24 hours upon admission were analysed by the researcher, collecting data on the medications. Discrepancies were identified by comparing the medication prescribed on admission with pre-hospital medication information in the BPMH.

4. Classification of discrepancies. Once identified, discrepancies were classified according to their intention and documentation. These were also ranged by severity and the pharmacotherapeutic classes involved were identified. These categories include the omission or addition of medications, therapeutic substitution (drug switch), changes in dose, frequency, pharmaceutical form, or route of administration.[8] A 'reconciliation' category was also considered for medication errors, referred to situations in which, based on the patient's clinical parameters at admission, the usual medication should not have been maintained or cases in which the medication was introduced but was already suspended prior to admission.

Intentional Discrepancies (ID) - These can be subdivided into 'documented' (when the justification for the change is duly recorded in the medical file) or 'undocumented' (when the justification is not clearly documented),[4] and these were divided into three categories regarding the justification for the change: explained by a change in clinical parameters, by following therapeutic guidelines or hospital protocols or by the additional need for confirmation of the justification by the prescribing physician.

Unintentional discrepancies (UD) or medication errors - The evaluation of UD, in addition to categorisation, was carried out using a criterion of severity/potential to cause harm. These were assessed by a physician specialising in clinical pharmacology, regardless of the study unit, based on the information required for clinical judgement. Categorisation complied with the Buckley *et al.* severity model, ranked in 'not clinically significant', 'clinically significant', 'clinically severe' or 'life-threatening'.[9]

5. Reporting discrepancies. Finally, discrepancies requiring an assessment were reported to the prescribing physician, either in person or by computer, for subsequent update, whenever required.

A quantitative descriptive analysis of the data sources used to obtain each patient's BPMH was carried out, as well as characterising the patient's age, number of medications and comorbidities, place of origin, type of admission, number of discrepancies and their classification. Microsoft Office Excel® 2019 database and SPSS® 2019 software were used in data analysis. The absolute and relative frequencies (percentages) of the variables analysed were calculated, as well as means and standard deviations.

The medication reconciliation was also analysed from a qualitative point of view aimed at identifying the resources required to its implementation at hospital admission, as well as identifying opportunities to optimise the existing resources.

RESULTS

Study population

A mean age of 77.04 ± 13.74 years (mean ± standard deviation) was found in our group of patients (80% aged ≥ 65 years and 33% female) (Table 1). A pre-hospital number of 7.72 ± 3.01 medications/patient was found, ranging from one to 14 medications per patient. Polypharmacy was identified in 85% of the participants, as well as a common profile of multiple comorbidities (Table 2), including respiratory failure, hypertension, and type-2 diabetes mellitus as the most prevalent pathologies. Lung diseases (32%), mainly bacterial pneumonia (ICD J15), followed by cardiovascular diseases (16%), genitourinary (14%) and digestive diseases (12%) were mostly found on admission.

Data sources for BPMH

An average of 41.80 ± 8.40 minutes were spent per patient in reaching the BPMH, including an average interview time of 11.0 ± 3.20 minutes, while the analysis of any other data sources took the rest of the time spent. The interview had to be carried out with a family member in 48% of cases; only in 22% of the cases an interview with the patient was available while, in the case of institutionalised patients, family members were unable to provide the information, and this was confirmed by the nursing home staff. The medication list provided by the patients or by the nursing home was analysed in 49% of the participants and the medication bag in 25%.

Table 1 – Characteristics of socio-demographic data of the study population (n = 100)

Variables	Results
Sample, n (%)	100 (100%)
Age, (mean ± SD)	77.04 ± 3.74
Gender, n (% female)	33 (33%)
Residence, n (%)	
Home	67 (67%)
Nursing home	28 (28%)
Long-term care (LTC) unit	5 (5%)
Admission, n (%)	
Emergency	94 (94%)
Outpatients	6 (6%)
Katz indez, n (%)	
0	34 (34%)
1 – 2	16 (16%)
3 – 4	9 (9%)
5	13 (13%)
6	28 (28%)

Clinical data on any of the three items (prescriptions for the past six months, chronic medication list and medication orders) were unavailable in 17% of the patients. In the remaining patients in whom data were available, 'medication orders' were always available. However, 'prescription record for the past six months' were only available in 54% of the patients and, even though a 'chronic medication list' was available, this was outdated regarding 59% of the patients, when compared to the interview.

Identification and classification of discrepancies

In total, 791 discrepancies were found, while intentional discrepancies (95.7%) were classified as documented regarding 50.9% of the patients. Undocumented intentional discrepancies were analysed and divided into those explained by clinical conditions and parameters (15.05%), hospital protocols and guidelines (43.55%) and the need for additional confirmation from prescribing physicians (41.40%). The categorisation of discrepancies (ID and UDs) is shown in Figs. 1 and 2.

Thirty-four UD or medication errors were found in 22 patients; 55.88% were assessed as having no clinical relevance for the patients and mainly involved the omission of analgesic or lipid-lowering agents; those that were classified as having the potential to cause clinically significant or clinically severe harm involved eight and two patients respectively (corresponding to 32.35% and 11.76% of all UD). Potentially harmful discrepancies were classified in the conciliation and omission categories (90.90%), the latter involving anxiolytics (27.27%), antidepressants (18.18%), antianemic drugs (18.18%), antigout drugs (18.18%), vasoprotective drugs (9.09%) and adrenergic inhalers associated with corticosteroids (9.09%). Clinically severe discrepancies involved drugs with action on the cardiovascular system, namely beta-blocking agents (50%) and diuretics (50%). The categories involved included omission (50%), dose change (25%) and conciliation (25%).

Required resources and opportunities for optimisation

The constraints that were identified during the medication reconciliation process included the lack of IT tools to support the process, lack of standardisation in the recording of therapeutic information and changes, constraints in the access to patients' family members or healthcare institutions (time spent to obtain the interview, lists or bags of medicines) and the lack of availability from prescribing physicians (communication, feedback and solving discrepancies).

The required resources to implement medication reconciliation effectively and sustainably in clinical practice were divided into six main categories, including regulations, process, staffing, management, tools, and training. Failures in at least one of these items imply challenges in the applicability of medication reconciliation, which automatically configures them as intervention points (Fig. 3). In this study, based on the constraints identified, the main resources mainly involved the categories of process, tools, and staffing.

DISCUSSION

Although medication reconciliation alone was not responsible for reducing medication errors and increasing

Table 2 – Clinical data of the study population (n = 100)

Variables	Results
Sample, n (%)	100 (100%)
Autonomy in medication management, n (%)	
Patient	26 (26%)
Family/caregiver	38 (38%)
Professional of day-care/LTC/Day care centre	36 (36%)
Number of pre-hospital medications, (mean ± SD)	7.72 ± 3.01
Number of pre-hospital medications, n (%)	
1 – 4	15 (15%)
5 – 9	56 (56%)
≥ 10	29 (29%)
Allergy to medication, n (%)	
Yes	8 (8%)
No	92 (92%)
Number of comorbidities, (mean ± SD)	7.80 ± 2.53
Number of comorbidities, n (%)	
0 – 4	10 (10%)
5 – 9	67 (67%)
10 – 15	23 (23%)

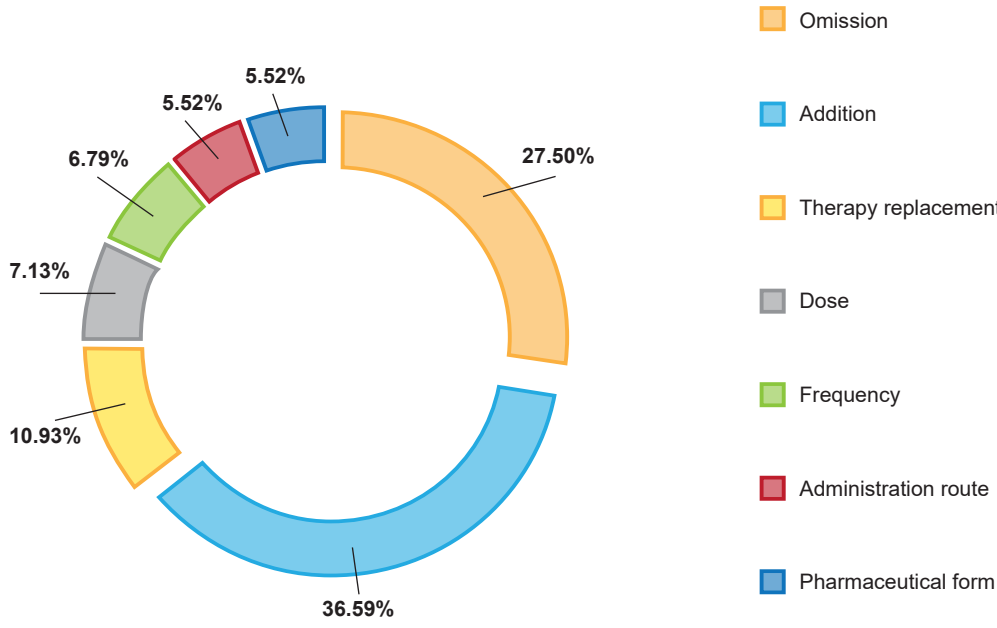

Figure 1 – Intentional Discrepancies

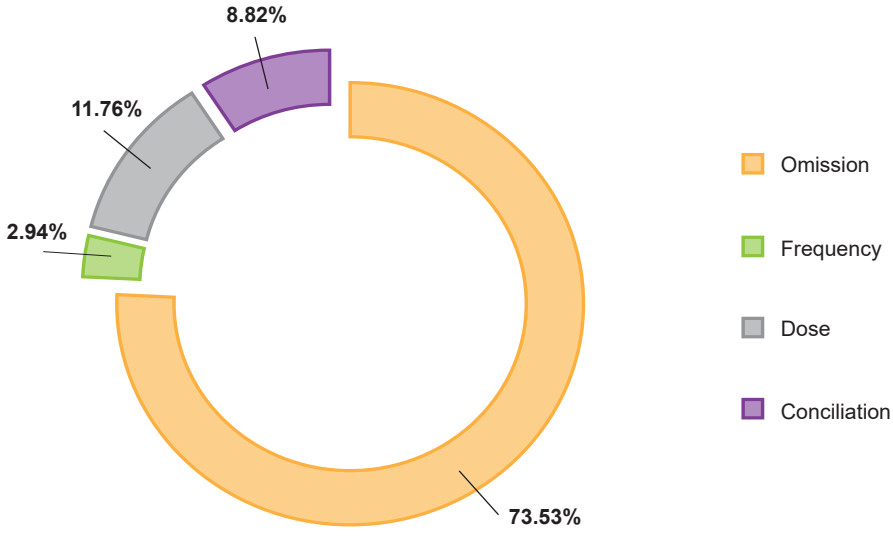

Figure 2 – Non-intentional Discrepancies

patient safety, it seems to be the first and perhaps most critical piece of the jigsaw involving the management of therapeutic information in the transition of patient care.[10] Therefore, to implement more comprehensive action plans, a step-by-step action is required. This pilot study was aimed at providing a mapping of the main resources required, with the identification of opportunities for optimisation, defined as strategies and actions reducing constraints to reconciliation and making it more applicable.

The characterisation of the study population supported a previous analysis carried out on the evolution of our department over the past 20 years: a high prevalence of elderly patients, with multiple pathologies, polypharmacy and low autonomy in medication management, which are common to similar departments and which, according to literature, are risk factors in the transition of care.[12,13] Therefore, these have become potential targets for the implementation of medication reconciliation as a relevant tool with an impact on the identification of medication errors and subsequently preventing adverse events related to communication failures between departments and between patients and healthcare services.

The analysis of discrepancies has shown that 49.14% of ID were classified as undocumented, as no justification for

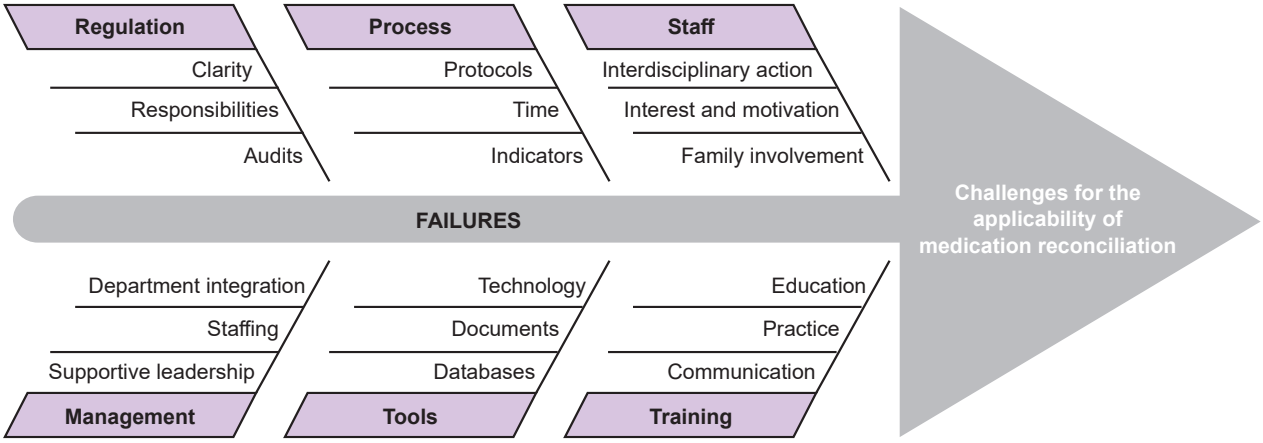

Figure 3 – Resources involved in medication reconciliation

the change was available in the patient's clinical file. These were considered as documentation failures, 41.4% of which did not meet the criteria for an intentional change based on clinical parameters or therapeutic change, and required additional clarification from the prescribing physician, involving some major therapeutic classes including lipid-lowering agents and antianemic drugs. Even though these were not considered medication errors and often do not represent an immediate risk to patient safety, undocumented discrepancies, even when intentional, involve an impact on the required resources and results of medication reconciliation, as they can generate misunderstandings, require additional clarification and lead to future medication errors, for example at discharge.[4,14,15]

Among the categories of intentional discrepancies that were found, the addition of a new medicine (e.g., introduction of anti-infective agents), the omission of any previous medication (e.g., discontinuation of antihypertensives) and replacement of one medicine for another for the same therapeutic aim (e.g., subcutaneous insulin replacing oral antidiabetics) were the most frequently found categories. When applying medication reconciliation, it should be considered that intentional changes to the patient's medication are frequently explained by the clinical condition that led to hospitalisation, by the established therapeutic response plan and by the therapeutic arsenal available in the hospital.

Whenever intentional discrepancies are found, these must be recorded and can be consulted and communicated clearly between professionals and the patients, so that when these return to their daily lives, patients may know which medicines have been discontinued, changed or added. This is where the relevance of reconciliation lies, both at admission and at discharge, as it allows therapeutic information to be longitudinal throughout the hospitalisation and supports the construction of the discharge plan, strengthening the patient's adequate adherence to treatment and achieving the established outcomes.

As regards unintentional discrepancies, the omission of medicines (e.g., medicines with action on the central nervous system and cardiovascular system) was found as the most frequent category, in line with literature.[9,16,17] This occurs when there is a failure to reconcile a medicine that the patient was previously taking and then does not take during hospitalisation, which can be related to different reasons for no effective communication. The clinical significance of this omission, however, will depend on the drug omitted and the patient's clinical condition (e.g., omission of antiepileptic drugs or beta-adrenergic agonists and the risk of withdrawal syndromes with onset of symptoms, or even withdrawal syndromes or rebound effect). These omissions can often delay or even prevent the identification of diagnoses caused using a specific drug that may have directly or indirectly caused the hospital admission.[18]

The data on accessing, obtaining, and recording therapeutic information and changes therefore showed that there were flaws in the documentation process and highlight the need for protocols for recording therapeutic information, as well as the development and optimisation of tools supporting the reconciliation process, with better systematisation of this information, making it more easily transferable and communicable during and upon hospitalisation.

An average of 41.8 ± 8.4 minutes was spent per patient in the medication reconciliation process, in terms of obtaining and recording therapeutic information in data sources, in line with what was found in studies with similar characteristics, including those by Giannini *et al.* (2019), with an average time of 47.0 ± 18.0 minutes found in a department of internal medicine in Switzerland.[19] The time spent in the medication reconciliation process depends on many factors. The availability of information provided by patients is linked to their knowledge of the therapeutic regimen or the clinical condition. In these situations, family members or healthcare institutions are sources of information to be considered. However, the difficulty in contacting these or their lack of knowledge about the patient's therapy often jeopardises the timely or complete provision of information.[19] Therefore,

lists or even medicines brought physically to the hospital, as well as electronic primary care records, could help with data collection. However, these factors depend on the availability of access and updating, limiting the resources required and influencing whether reconciliation is carried out within the first 24 hours of admission.

As shown in results (Fig. 3), medication reconciliation is influenced by different resources, as this is a process requiring coordinated and integrated actions, including the regulations in force, the process itself, the people involved (including professionals, patients, and caregivers), local management and other services, in addition to the tools available and the training of those involved. All these factors are time-consuming, particularly in the context of hospital admissions, reinforcing the relevance of mapping the process, identifying key points and actions based on the contribution of technology and shared actions within the healthcare team.

Based on the priority resources that were identified, opportunities for optimisation were divided into four topics that could make medication reconciliation more applicable, reducing weaknesses, such as the lack of robust electronic records (e.g., PDS) or even the frequency of omission as the most prevalent discrepancy category. These were the opportunities found: (i) optimising the available data sources - improving the quality of the BPMH and expanding the access to clinical information; (ii) standardising and computerising the process - integrating therapeutic information from admission to discharge reducing duplications, confusing information and standardising records; (iii) multidisciplinary action - defining responsibilities, integrated actions and greater involvement of hospital pharmaceutical departments; (iv) priority groups - based on mapping the profile of patients and discrepancies and risk stratification. The opportunities identified or also reported in literature as facilitating factors support the results of other analyses carried out on the transition of care, looking for the identification of strategies for structuring safe medication practices.[20,21]

Many institutions do not have the required staff to implement reconciliation in a comprehensive way, which could jeopardise the success of interventions.[22] Considering this reality, the department management ends up fearing the availability of resources, as the benefits are not sufficiently clear. This prevents a clear observation of the impact of this tool on clinical practice. Therefore, pilot studies such as this one can help in this regard by identifying priorities and subsequently better targeting the available resources.

Since the implementation of an incomplete reconciliation process could jeopardize patient safety rather than ensuring it,[23] the knowledge of the flows and procedures is crucial to promote consistent actions aimed at moving forward.[22] Therefore, the identification of the department's profile in terms of the main pathologies, drugs and discrepancies allows for more focused actions, based on real parameters.

Contributions and limitations

This study was aimed at the identification of the current practices, the analysis of critical points and strategies that could contribute to this and other similar services. Its limitations include the absence of a pharmacist working in the clinical team, as well as the lack of a history or comparison group. The validation of the method in other departments, as well as the application of the optimisation could be analysed in further studies.

Clinical implications

The main resources aimed at the implementation of medication reconciliation in clinical practice should be focused on planning and structuring the process with the establishment of protocols, responsibilities and monitoring with quality indicators, as well as the robustness of the databases and clinical information systems available, their integration, updating and access between departments. Finally, the need for availability and collaborative action by the multidisciplinary team are worth mentioning, as well as the involvement of the patients or caregivers in transitional care, with the aim of achieving a less costly process aimed at improving patient safety.

More than just an accreditation criterion, which can sometimes be bureaucratic and costly, medication reconciliation should be seen and treated with the overall aim of patient safety, not just during hospital stays, but throughout the continuum of care, including the patient's own home, social institutions, healthcare centres, community pharmacies and other healthcare settings.

CONCLUSION

The results have shown the presence of constraints as regards the transmission and recording of therapeutic information at the primary care/hospital interface, as well as in internal hospital processes. Better access to data sources, improved methods for documenting therapeutic information and its changes, as well as the interdisciplinary action are key points to be considered when optimising the applicability of medication reconciliation in the department.

ACKNOWLEDGMENTS

The authors wish to acknowledge the head of the department of internal medicine, Armando de Carvalho, for his support to this manuscript.

AUTHOR CONTRIBUTION

TCS: Study design, data collection, data analysis and interpretation, writing and final approval of the manuscript.

PD: Study design, data collection and critical revision of the manuscript.

CAC: Data collection, data analysis and interpretation and critical revision of the manuscript.

JF: Study design and critical revision of the manuscript.

ML: Analysis and interpretation of data and critical revision of the manuscript.

JO: Critical revision of the manuscript.

IVF: Study design, critical revision, and final approval of the manuscript.

MR: Study design, data analysis and interpretation, critical revision, and final approval of the manuscript.

MC-B: Study design, data analysis and interpretation, critical revision, and final approval of the manuscript.

HUMAN AND ANIMAL PROTECTION

The authors declare that this project complied with the regulations that were established by the Ethics and Clinical Research Committee, according to the 2013 update of the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

FINANCIAL SUPPORT

The authors declare that there was no financial support in writing this manuscript.

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