



Medication Discrepancies Identified During Medication Reconciliation in Patients in a Medium-Sized Hospital

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ABSTRACT

Objective: To analyze (evaluate) the Medication Discrepancies (MD) in prescriptions of patients during a Medication Reconciliation (MR) service at admission to the Medical Unit.

Methods: A cross-sectional study was conducted from March 2021 to February 2022, in a medium-sized hospital of Minas Gerais state, Brazil. Patients aged 18 years or older and under continuous use of at least one medication at the moment of hospital admission were included. The first MR service interview was preferably conducted within 24 hours and should take place until 48 hours of admission. Socio-demographic data, health indicators, detailed information about home pharmacotherapy, and information of potential medication discrepancies were collected. The pharmaceutical care data and medical records were analysed using Stata 13.0 software. Pearson's *Chi-square* test was performed for the statistical analyses (significance 5%). The study was approved by the research ethics committee of the Universidade Federal de Ouro Preto (CEP)/UFOP under number 4.845.642.

Results: The majority of the 215 patients included were female (n=115; 53.5%), mean age of 68 ± 18 years, and patients aged ≥ 65 years (n=131; 61.0%) were prevalent. The mean number of medicines being used at the moment of hospital admission was 6 ± 3 , and poly pharmacy was identified in 128 (59.5%) patients. The most prevalent comorbidities were diabetes mellitus and hypertension and the presence of at least one of these two comorbidities was observed in 80.0% of the patients (n=172). The variables age group (p=0.005), polypharmacy (p<0.001), having hypertension and/or diabetes mellitus (p=0.001), hospitalization for infectious and parasitic diseases (p<0.001) and circulatory system diseases (p=0.040) have a significant relation to the occurrence of at least one MD in prescriptions. Drugs used in diabetes mellitus (p<0.001), agents acting on the renin-angiotensin system (p=0.028), lipid-modifying agents (p=0.026), medications for obstructive airway diseases (p=0.001), general nutrients (p=0.005) and thyroid hormone medications (p=0.002) were associated with unintentional MD.

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Conclusion: It was possible to identify a significant percentage of MD in the prescription evaluated. Poly pharmacy and age group were related to the occurrence of MD.

Keywords: Medication; Discrepancies; Hospital; Patients; Diabetes mellitus

INTRODUCTION

Patient safety is characterized by reducing the risk of unnecessary harm associated with health care [1]. Considering that the appropriate use of essential medicines is one of the most cost-effective components of health care, the World Health Organization (WHO) launched its third global challenge in 2017 entitled "Medication without Harm". Its statement included the goal of reducing potential harms related to medication use [2]. This challenge addresses priority actions with emphasis on high-risk situations, polypharmacy, and communication failures in management of health care [3,4].

Many medication errors are due to the patient omission of a medication at the moment of hospital admission and communication failure among health professionals by the care transition, compromising patient safety and treatment effectiveness [5]. Taken together, these factors can trigger permanent damage to the health and well-being of the patient, from hospital admission to the other stages of the care transition, corresponding to the most frequent cause of compromised patient safety and the emergence of problems related to the use of medications (DRP) [6,7]. The main role of the pharmacist is to evaluate the necessity, effectiveness and safety of medicines, identifying, preventing and solving the DRP [8]. The professional performance relies on using research tools and the best as possible information of the patient medication history, in order to provide care to the patient, their family and community, reducing adverse drug events and promoting patient safety [9].

Patient-centred care involves respecting the beliefs, expectations, experiences, attitudes, and concerns of the patient or caregivers regarding their health conditions and the use of medicines. Thus, the pharmacist and patient share decision-making and responsibility for health outcomes. In the hospital setting, pharmacists work into multidisciplinary teams, aiming to adequate pharmaco-therapeutic follow-up and resolution of DRP that may arise during treatment, in order to provide safer care to the patient [10]. Medication Reconciliation (MR) is a pharmaceutical service to prevent medication errors resulting from medication discrepancies, such as duplication or medications omissions, especially when the patient goes through different levels of care or different health services. The main objective is to promote rational use of medicines, establish efficient communication and ensure the correct given information to other health professionals. The clinical pharmacist intervenes to prevent and solve problems in drug therapy, in order to guarantee pharmacotherapeutic treatment success, as well as the promotion, protection and recovery of health and other problems in order to provide a better quality of life. These

services generate better and more accurate results in medication reconciliation, being part of the integral assistance to inpatients. Thus, this study aimed to analyze the medication discrepancies identified in prescriptions of patients admitted at the medical unit of a medium-sized hospital, during the medication reconciliation service.

MATERIALS AND METHODS

The procedures adopted in this study are in accordance with the ethical principles in research (ref). Data collection and analysis were approved by the Research Ethics Committee of the Universidade Federal de Ouro Preto (CEP)/UFOP under opinion number 4.845.642. This was a cross-sectional study, carried out from March 2021 to February 2022, conducted in a medium-sized hospital in the unconfident's region, Minas Gerais state, Brazil. The study population consisted of patients attended by the MR pharmaceutical service, aged 18 years or older and who were in continuous use of at least one medication at the time of hospitalization in the Medical Unit. This was a hospital sector for adult patients with clinical diagnoses and treatment of diseases without surgical procedures demand. Patients unable to respond about their home pharmacotherapy due to some disability or whose relative or caregiver did not have information about pharmacotherapy, were excluded [11].

The first interview of the MR services was carried out preferably within 24 hours after hospital admission and may take place within 48 hours of admission. During the interview, sociodemographic data, health indicators and detailed information about home pharmacotherapy were collected. At the bedside pharmaceutical care, the patient medication history information was collected and the reconciliation of the continuous medicines used with the medicines prescribed during the hospital stay was performed. The differences between the list of the patient continuous use medications identified at the hospital admission and the hospital prescription were called discrepancy, classified as intentional (suspended use based on the clinical situation, suspended use due to therapeutic duplicity, change of posology or administration frequency, dose change and change of administration route) or unintentional (omission of medication use).

During the study period, 1,051 patients were admitted for hospitalization in the medical unit sector. From those 270 (25.7%) were attended by the clinical pharmaceutical service of MR. However, 55 patients met the exclusion criteria of the study, resulting in 215 patients (20.5%) included in this study (Figure 1).

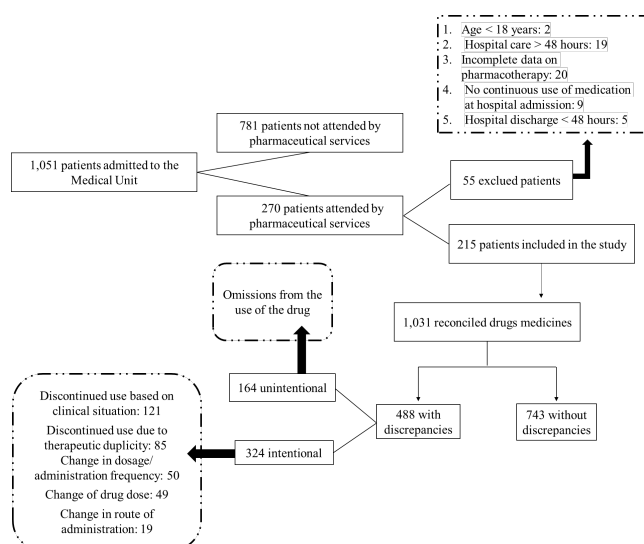


Figure 1: Patients were admitted for hospitalization in the medical unit sector.

The outcome variable was the occurrence of MD identified by pharmacists during MR. The population was characterized by socio-demographic variables (gender/sex, age group, time and type of hospitalization), health indicators (history of drug allergy, comorbidities, hospitalization diagnosis) and profile of medicines used at hospital admission. Polypharmacy was defined as the concomitant use of five or more medicines, by the same patient [12]. The medicines were described according to the Brazilian Common Denomination (DCB) and classified according to the second and fifth level of the Anatomic Therapeutic Chemical (ATC).

Table 1: Hospitalization diagnoses of patients attended by the medication reconciliation service of a medium-sized hospital in Minas Gerais, Brazil, according to ICD-10 chapters, from March 2021 to February 2022.

Chapters	Codes	Description	n	%
I	A00-B99	Certain infectious and parasitic diseases	66	30,7
IX	I00-I99	Diseases of the circulatory system	45	20,9
XIV	N00-N99	Diseases of the genitourinary system	22	10,2
X	J00-J99	Diseases of the respiratory system	31	14,4
IV	E00-E90	Endocrine, nutritional and metabolic disorder	10	4,7
XI	K00-K93	Other diseases of the digestive system	8	3,7
V	F00-F99	Mental and behavioural disorders	8	3,7
		Other hospitalization diagnoses	25	11,6
		Total	215	100

The variables age group ($p=0.005$), polypharmacy ($p<0.001$), having at least one of the two most prevalent comorbidities,

The descriptive and statistical analyses were performed in Stata 13.0 software. To assess the correlation between MD and explanatory variables, Pearson's *Chi-square* test was performed. The statistical significance threshold was 5%.

RESULTS AND DISCUSSION

From the 215 patients attended by the clinical pharmaceutical service of MR, the majority were female ($n=115$; 53.5%), mean age of 68 ± 18 years, with patients aged ≥ 65 years ($n=131$; 61.0%) being the most prevalent. The majority of hospitalizations occurred in Brazilian unified health system (SUS) beds (90.7%; $n=195$). The mean length of hospital stay was 8 ± 7 days and 61.9% of patients ($n=133$) had a maximum of 7 days of hospitalization. Previous drug allergy was reported by 15.3% of patients ($n=33$). The mean number of medicines used at the hospital admission was 6 ± 3 and poly pharmacy was identified in 59.5% ($n=128$) of patients. The most prevalent comorbidities were diabetes mellitus and hypertension and the presence of at least one of these two comorbidities was observed in 80.0% ($n=172$) of patients. The most prevalent hospitalization diagnoses, according to ICD-10 chapters, were certain infectious and parasitic diseases ($n=66$; 30.7%), circulatory system diseases ($n=45$; 20.9%) and genitourinary system diseases ($n=22$; 10.2%). Among these, the most prevalent ICD-10 was B34.2: Coronavirus infection of unspecified location (27.4%; $n=59$), under Chapter (Table 1).

hypertension or diabetes mellitus ($p=0.001$), hospitalizations for infectious and parasitic diseases ($p<0.001$), and circulatory

system disease ($p=0.040$) were significantly related to the occurrence of at least one MD in prescriptions (**Table 2**).

Table 2: Bivariate analysis of the occurrence of medication discrepancies in prescriptions evaluated by the MR services ($n=215$) in the Medical Unit sector of a medium-sized hospital in relation to socio-demographic characteristics and health indicators, March 2021 to February 2022.

Variables	Patients seen by the medication reconciliation service			p
	n	%	MD** n (%)	
Gender				0.505
Male	100	46,5	77 (77,0)	
Female	115	53,5	84 (73,0)	
Age group				0.005
18 to 44 years	26	12	15 (57,7)	
45 to 64 years	58	27	38 (65,5)	
≥ 65 anos	131	61	108 (82,4)	
Type of hospitalization				0.273
SUS	195	90,7	144 (73,9)	
Health plan	20	9,3	17 (85,0)	
Length of stay				0.649
1 a 7 dias	133	61,9	101 (75,9)	
≥ 8 dias	82	38,1	60 (73,2)	
History of drug allergy				0.237
No/Does not know	182	84,7	139 (76,4)	
Yes	33	15,3	22 (66,7)	
Polypharmacy				<0.001
No	87	40,5	50 (57,5)	
Yes	128	59,5	111 (86,7)	
People with systemic hypertension and/or diabetes mellitus				0.001
No	43	20	24 (55,8)	
Yes	172	80	137 (79,7)	
Presence of a companion				0.258
No	74	34,4	52 (70,3)	
Yes	141	65,6	109 (77,3)	
Certain infectious and parasitic diseases (Chapter I)*				<0.001
No	163	75,8	133 (81,6)	
Yes	52	24,2	28 (53,9)	
Diseases of the circulatory system (Chapter IX)*				0.04
No	170	79,1	122 (71,8)	

Yes	45	20,9	39 (86,7)	
Diseases of the genitourinary system (Chapter XIV)*				0.429
No	193	89,7	143 (74,1)	
Yes	22	10,2	18 (81,8)	
Diseases of the respiratory system (Chapters X)*				0.924
No	184	85,6	138 (75,0)	
Yes	31	14,4	23 (74,2)	
CID: Other chapters*				0.139
No	150	69,8	108 (72,0)	
Yes	65	30,2	53 (81,5)	

Note: Absolute, relative values and threshold for statistical significance was p values ≤ 0.05 . *Chapters according to ICD-10; **MD: Medication Discrepancy

According to Pereira et al., in a population-based study, it was observed that polypharmacy and sociodemographic characteristics revealed association with female gender and elderly above 80 years, and that regardless of socioeconomic variables a higher prevalence of polypharmacy is related to female gender. This could be related to the fact that women commonly are more careful and concerned about their health than men. A retrospective cohort study conducted with inpatients in the surgical clinic sector in a teaching hospital, between 2014 and 2018, in a city of Alagoas state, Brazil, observed that from 338 patients included in the study, 187 (55.3%) had MD identified at the first prescription after hospital admission. Female patients were the most prevalent and the most frequent type of MD was medication omission (93.0%). Additionally, they observed association of MD with comorbidities ($p=0.000$) and elderly patients aged 60 years or older ($p=0.007$), but not associated with hospitalization [13]. These findings corroborate the results of the present study, demonstrating that length of stay is not related to the occurrence of MD, but that group age and comorbidities suggesting that the elderly may be a risk factor for the occurrence of MD on hospital admission. Thus, it was highlighted that the elderly should be prioritized regarding the MR services after hospital admission in order to reduce potential damage by pharmacotherapy. A narrative literature review on MR performed in the elderly pointed out the existence of a positive association between the numbers of medicines used by the patient and the rate of discrepancies, being the omission of medications the predominant type of discrepancy [14]. Our results also corroborate these findings, demonstrating a significant relationship between polypharmacy and the presence of MD. The type of unintentional discrepancy due to omission of medications can be a worrying factor when collecting a patient medication history at the moment of hospital admission. Taking this difficulty to account, the MR service demonstrates optimization and rationalization of the patient pharmacotherapy aimed at patient safety and reduction of Adverse Drug Events (ADE) in

the care transition process ref. Unintentional MD are related to un-intentionality of the prescriber to not prescribe a medicine that is part of home pharmacotherapy or to change prescription on admission by information omission [15]. An observational study in the cardiology unit of a large hospital identified 50.4% of the 117 discrepancies as the unintentional type, with omission of medications being the most prevalent. Chung et al., conducted a study in the cardiology department of a hospital in France and observed 544 MD and also omission as the most frequent (70.1%), arising from different causes during the information transfer process. An uncontrolled study conducted in Spain for one year in a hospital and three basic health units, identified MD in 143 patients, and it was necessary 228 MR for 126 patients [15]. The main type of discrepancy was that patients were not taking medicines listed in their active medical records ($n=152$; 58.7%) [16]. It was possible to resolve the MD of the 126 patients by reducing the number of medicines in use per patient, reducing hospital admissions and there was association with greater economic and social accessibility [17]. Another cross-sectional study in a clinical unit of a public hospital in southern Brazil identified that 94.0% of the interviewed patients had at least one DM [18]. In the present study, the amount of medication in use at the time of hospital admission can be characterized as poly pharmacy, and the prevalent type of DM as unintentional by omission. These data corroborate the aforementioned study, and demonstrate worrying factors for the health team, given the difficulty in managing drug therapy in light of their comorbidities and clinical situation that led to hospitalization. The MR had a positive impact on health care, showing that patients treated by the service have up to 20% less chances of being readmitted for a hospitalization [19]. In this context, MR services is an effective strategy for identification of MD and that the omission, when identified in the pharmacotherapeutic analysis, allows the occurrence of avoidable clinical consequences, increasing patient safety.

A total of 1,231 medicines were reconciled, of which 488 (39.6%) had MD on prescription at the time of hospital admission. The most frequent pharmacological classes among MD were drugs used in the treatment of diabetes mellitus (n=72; 14.8%), diuretics (n=58; 11.9%), and agents with action on the renin angiotensin system (n=40; 8.2%). Among these, 324 (66.4%) had an intentional discrepancy (Chart 1). Of the 488 reconciled medications that had MD, 33.6% (n=164) had a discrepancy of the unintentional type caused by omission of medicine use. Regarding intentional discrepancies, suspended use based on clinical situation (n=121; 24.8%), suspended use due to therapeutic duplicity (n=85; 17.4%), alteration of dosage/frequency of administration (n=50; 10.2%), alteration of drug dose (n=49; 10.0%), and alteration of route of administration (n=19; 3.9%) were identified.

The most common therapeutic classes in unintentional DM due to omissions were lipid-modifying agents (n=16; 21.9%), followed by antithrombotic agents (n=13; 12.4%) and diuretics (n=13; 9.50%). The most common drugs for unintentional DM were simvastatin (C10AA01–n=6), fenofibrate (C10AB05–n=5), acetylsalicylic acid (B01AC06–n=10) and furosemide (C03CA01–n=8). Medicines used in Diabetes Mellitus (p<0.001), agents acting on the renin-angiotensin system (p=0.028), lipid modifying agents (p=0.026), medicines for obstructive airway diseases (p=0.001), general nutrients (p=0.005) and thyroid hormone medicines (p=0.002) were associated with unintentional MD (Table 2). In the study by Barboza da Silva et al., considering the analysis of medicines in ATC level 1, it was described as most present drugs those acting on the cardiovascular system. The study of Gai observed that the classes of psychoanaleptics (17.5%), followed by diuretics (15.8%) and medicines for acid disorders (12.3%) were the most involved in the omissions and the medicines most involved in the omissions were omeprazole, followed by citalopram. In the present study, it was observed that the drugs losartan, simvastatin and fenofibrate were the most present in the cardiovascular system, second only to levothyroxine.

In the study by Oñatibia-Astibia et al. the drug groups with the greatest discrepancy were drugs for obstructive airway diseases (R03; 8.3%, n=19), psychoanaleptics (N05; 8.3%, n=18) and anti-inflammatory products and nonsteroidal antirheumatics (M01A; 7.5%, n=17). Through this, it is possible to observe that it was suggested that patients on drug therapies at the cardiovascular level are a population at risk for DM and therefore should be prioritized for the MR services. The variety of drugs cited among the studies that showed a correlation between the therapeutic classes with the onset of DM can be explained by the location where the study was carried out, reinforcing the need to characterize the population and the profile of the drugs used, so that the health team can fully assist in the management of pharmacotherapies in order to reduce adverse effects to medications and therapeutic ineffectiveness due to the absence of medication use. The predominant classes of medicines that presented unintentional MD indicate the correlation with the comorbidities hypertension and diabetes mellitus, demonstrating the need for special attention to these patients, who are more susceptible to the occurrence of MD in prescription. Hospitalizations for infectious and parasitic diseases were the most frequent type of hospitalization due to the period of the study occurring in times of pandemics by the new Coronavirus infection. Thus, the MR services and the patient care process, by proposing measures to reduce risks and mitigate adverse events, collaborate to strengthen the Brazilian Patient Safety Program and the WHO's global challenge to assure medication without harm. That's why knowledge of the profile of medicines used by patients is an essential strategy to reduce medication errors during transitions of health care (Table 3).

Table 3: Bivariate analysis of the frequencies of medications reconciled (n=1231) by the MR service according to unintentional discrepancies caused by medication omissions, in the Internal Medicine sector of a medium-sized hospital, Brazil, March 2021 to February 2022.

Second level of ATC	Description	Reconciled medications		Unintentional MD	
		N	%	Omission n (%)	P
C03	Diuretics	137	11,1	13 (9,50)	0,161
A10	Drugs used in diabetes	124	10,1	4 (3,2)	<0,001
C09	Agents acting on the renin–angiotensin system	118	9,6	8 (6,8)	0,028
B01	Antithrombotic agentes	105	8,5	13 (12,4)	0,767
C07	Beta blocking agentes	80	6,5	8 (10,0)	0,366
N03	Antiepileptics	77	6,3	10 (13,0)	0,929

C10	Lipide modifying agente	73	5,9	16 (21,9)	0,026
N06	Psychoanaleptics	65	5,3	5 (7,69)	0,170
N05	Psycholeptics	63	5,1	8 (12,7)	0,881
C08	Calcium channel blockers	53	4,3	6 (11,3)	0,661
A02	Drugs for acid related disorders	38	3,1	8 (21,1)	0,154
R03	Drugs for obstructive airway diseases	38	3,1	12 (31,6)	0,001
V06	General nutrientes	34	2,8	10 (29,4)	0,005
H03	General nutrientes	32	2,6	10 (31,3)	0,002
OTC	Other classes on the second level of ATC	194	15,8	33 (17,0)	0,100
Total		1031		164	

Note: Threshold for statistical significance was p values ≤ 0.05

CONCLUSION

It was possible to identify a significant percentage of MD in the prescription evaluated. Poly pharmacy and age group were related to the occurrence of MD.

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