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## Perceptions of nurses, pharmacists and physicians about medication reconciliation: A multicenter study



Giulyane T. Aires-Moreno<sup>a</sup>, Carina C. Silvestre<sup>b</sup>, Dyego C.S.A. Araújo<sup>a</sup>, Vanessa T.G. Matos<sup>c</sup>, Vanessa Marcon de Oliveira<sup>c</sup>, Cristiane M. Ferreira<sup>c</sup>, Erica F. Vasconcelos-Pereira<sup>c</sup>, Ana R.P. Lira<sup>d</sup>, Clarice Chemello<sup>d</sup>, Layse M.S. Oliveira<sup>e</sup>, Alfredo D. Oliveira-Filho<sup>a,e</sup>, Divaldo P. Lyra Jr.<sup>a,\*</sup>

<sup>a</sup> Laboratory of Teaching and Research in Social Pharmacy (LEPFS), Department of Pharmacy, Federal University of Sergipe, São Cristóvão, SE, Brazil

<sup>b</sup> Department of Pharmacy, Life Sciences Institute, Federal University of Juiz de Fora, Governador Valadares, MG, Brazil

<sup>c</sup> Pharmacy School Professor Ana Maria Cervantes Baraza, Faculty of Pharmacy, Food and Nutrition, Federal University of Mato Grosso do Sul, Campo Grande, Brazil

<sup>d</sup> Center for Pharmaceutical Care Studies, Department of Social Pharmacy, College of Pharmacy of Federal University of Minas Gerais, MG, Brazil

<sup>e</sup> School of Nursery and Pharmacy (ESENFAR), Federal University of Alagoas, Maceió, AL, Brazil

### 1. Introduction

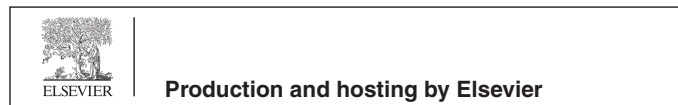
At the hospital, transitions of care (admission, internal transfers and hospital discharge) are susceptible to several medication errors (Cornish et al., 2005; Lehnbohm et al., 2014; Moore et al., 2003). On admission, 22–72.4% of patients may experience discrepancies in their pharmacotherapy (Huynh et al., 2013). Similarly, 62% of patients had omitted medications at the time of internal transfer within a hospital (Lee et al., 2015). Likewise, other studies reveal medication errors at hospital discharge (Kripalani et al., 2007; Liu et al., 2018).

Medication reconciliation is a service, recommended by several international patient safety organizations, to improve pharmacotherapy during care transitions, preventing until 90% of medication errors and improving communication among healthcare professionals (Almanasreh et al., 2016; Lehnbohm et al., 2014; WHO, 2019). During this service, the professional evaluates each medication in use to determine whether pharmacotherapy can be continued, suspended or intentionally modified, generating the Best Possible Medication History (BPMH) that prevents and resolves discrepancies that can lead to medication errors (Almanasreh et al., 2016; WHO, 2019). At the next transition, the changes made to the BPMH should be communicated to the patient/family members and future health care providers (WHO, 2019).

\* Corresponding author at: Laboratory of Teaching and Research in Social Pharmacy (LEPFS), Cidade Universitária “Prof. José Aloísio Campos”, Jardim Rosa Elze, São Cristóvão CEP: 49100-000, Brazil.

E-mail address: [lepfs.ufs@gmail.com](mailto:lepfs.ufs@gmail.com) (D.P. Lyra Jr).

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Nurses, pharmacists and physicians who are involved in different services and roles within the hospital environment have low interactivity and little knowledge about medication reconciliation, causing problems for patient safety (Boockvar et al., 2011; Rangachari et al., 2019; Sanchez et al., 2014; Van Sluisveld et al., 2012). Divergences among these professionals during medication reconciliation can be related to their perceptions about responsibilities at different transition points (Al-hashar et al., 2015; Alix et al., 2018; Lee et al., 2015; Rangachari et al., 2019).

The lack of clarity about how professionals can perform medication reconciliation in a qualified manner may justify carrying out specific studies that characterize the main flaws in this process in order to propose effective interventions that optimize patient safety. In addition, most published studies are limited to specific scenarios and do not compare the plurality of different perceptions of nurses, pharmacists, and physicians, neither their habits, customs nor cultures of patient safety. Therefore, the aim of this study was to analyze the perception of nurses, pharmacists and physicians about medication reconciliation.

### 2. Methods

#### 2.1. Design and study duration

A cross-sectional and multicenter survey was carried out between February and July 2019 in four hospitals in Brazil.

#### 2.2. Study location

This study was carried out in pediatric wards at four Brazilian teaching hospitals in four different geographic regions (Brazil has more than 8.5 million km<sup>2</sup>): Clinical Hospital of Federal University of (HC/UFMG) in Belo Horizonte (MG), University Hospital of Federal University of Sergipe (HU/USF) in Aracaju (SE), University Hospital Maria Aparecida Pedrossian of Federal University of Mato Grosso do Sul (HU/UFMS) in Campo Grande (MS) and University

Hospital Professor Alberto Antunes of Federal University of Alagoas (HU/UFAL) in Maceió (AL).

In this study, the described hospitals will be presented in text as Hospitals A, B, C and D, and the sequence of letters does not correspond to previous sequence. All hospitals belonging to Brazilian Company of Hospital Services as part of a set of measures adopted by the Federal Government of Brazil for the restructuring of hospitals linked to federal higher education institutions. EBSERH is currently responsible for the management of 40 Federal University Hospitals. These teaching hospitals were chosen since they are references in the care of children in their regions. Two centers participating in the multicenter study have the medication reconciliation service in pediatric wards (Hospital A and B), while the other two centers are still implementing this service in their pediatric wards (Hospital C and D). In hospital A and B the medication reconciliation includes patient (or family) completed report about therapy (medications, herbs, folk remedies or other alternative medications) that the patient is using in home (before hospital admission), internal transfers and hospital discharge.

### 2.3. Study sample

The convenience sample consisted of nurses, pharmacists and physicians. At the time of the survey, there were 70 nurses, 12 pharmacists and 143 physicians, divided as follows: 11 nurses, 3 pharmacists and 21 physicians (Hospital A); 37 nurses, 7 pharmacists and 65 physicians (Hospital B); 9 nurses, 2 pharmacists and 23 physicians (Hospital C); 13 nurses and 34 physicians (Hospital D).

### 2.4. Inclusion criteria

Professionals who worked for Brazilian Company of Hospital Services and recently graduated professionals who performed postgraduate activities in the pediatric wards of hospitals.

### 2.5. Research steps

#### 2.5.1. Training of the team of researchers to collect data from the multicenter study

A team of 10 researchers was responsible for data collection in participating hospitals. In order for the collection to be carried out in a standardized manner, the main researcher (GTAM) of the center responsible for the study carried out prior classroom training, with a 12 h workload, according to the following schedule: explanation and review of concepts related to patient safety (4 h); discussion of clinical cases on medication reconciliation in pediatric patient care transitions (2 h); presentation of the instrument “Questionnaire for the assessment of medication reconciliation in Brazil” (Silvestre, 2018; Supplementary material) and simulation with pharmacists (4 h); and organization and planning for the application of the instrument according to the local work processes (2 h). The training was carried out in the four centers participating in the study.

#### 2.5.2. Data collection

The instrument “Questionnaire for the assessment of medication reconciliation in Brazil” (Silvestre, 2018) was delivered in print or sent via email via Google Form (Google Inc., Mountain View, CA, USA), to nurses, pharmacists and physicians who agreed to participate in research. In this last form of sending, professionals were allowed to answer the instrument when accessing the Google Form platform.

The instrument was previously developed by going through the content validation process using a Delphi method, which consists of the systematic and step-by-step evaluation of experts in order

to reach a consensus (Hasson et al., 2000). The professionals responded to the instruments according to their current practice at the respective institutions. The instrument contains 17 questions divided into four sections:

- A** – Importance of medication reconciliation.
- B** – Perceptions about medication reconciliation processes.
- C** – Activities about medication use in a hospital.
- D** – Sociodemographic data.

In section A of the instrument, it was analyzed the relationship between patient safety and medication reconciliation according to a five-point Likert scale, in which one corresponds to “totally disagree”, two “partially disagree”, three “indifferent”, four “partially agree” and five “totally agree”.

In section B, three questions approached if medication reconciliation happened on admission, internal transfers and hospital discharge. In each question, the professional chose one of the following answers: not performed at the hospital; conducted in all sectors with all patients; accomplished in the transfers of some sectors with all or some patients; done differently than described in the instrument; does not know how to inform/ignore the performance of the service at the hospital.

Section C is subdivided into 13 topics and each one covers an activity related to medication reconciliation. For each transition of care (admission, internal transfers, hospital discharge), four statements were described explaining the different stages of medication reconciliation: collecting the BPMH use; analysis and classification of intentional and unintentional discrepancies; intervention to resolve unintended discrepancies; and medical records that the medication reconciliation was carried out.

For each statement described, professionals indicated whether, in their opinion, the activity: (1) is being carried out in their hospitals; (2) if this activity is accomplished, who is (are) the professional (s) who perform (s) it; (3) and even if the activity is not fulfilled, which professional (s) should do it. The professionals were allowed, if necessary, to select more than one profession option. It is worth mentioning that it was suggested that professionals answer the instrument according to their experience in the pediatric wards where they worked at.

Finally, in section D, professionals answered their demographics about sex, age, profession, year of graduation, experience in hospital before residency, year of initiation of residency and participation in some training on medication reconciliation in the hospital they worked for.

#### 2.5.3. Data analysis

The instruments were submitted to verification and analysis of filling through storage in a database using the *software* Microsoft® Excel for Mac Version 15.19.1 (160212). The data for this application step were expressed in a descriptive manner and represented by numbers and percentages. The treatment and analysis of data and variables studied were expressed by means and standard deviations.

### 2.6. Ethical aspects

All professionals who agreed to participate in the research signed a Free and Informed Consent Form (ICF) guaranteeing the confidentiality of the research. This Project was approved by Research Ethics Committee of HU/UFS under the following number 3.097.029.

## 3. Results

Of the 195 professionals from the four hospitals, we could contact and invite 177 of them, of whom 76 (43%) professionals

accepted to participate in the research. Among the respondents were 14 (18.4%) nurses, 18 (23.7%) pharmacists and 44 (57.9%) physicians. The average training time for professionals was  $9.4 \pm 6.1$  years (Table A.1). Most respondents (64.9%) had a training time of five years or more.

In this study, professionals stated that there was a partial (14.5%) or total (81.6%) relationship between the medication reconciliation service and patient safety (Table A.2). When they were asked about the presence of the medication reconciliation service, most professionals were able to recognize there was some level of medication reconciliation at all points of care transition in hospitals that have this service. However, this recognition was also verified in the responses of professionals who work in hospitals that medication reconciliation service is not implemented in the pediatric wards (Table A.3).

In the wards where the service was already implemented, pharmacists and physicians were the professionals most often cited as responsible for carrying out the different stages of medication reconciliation. Pharmacists were most frequently cited on hospital admission, while physicians on internal transfers and hospital discharge (Table A.4).

The three professions had different opinions on which professional should perform the different stages of medication reconciliation. According to pharmacists, all stages of medication reconciliation should be carried out by themselves, followed by physicians and nurses. Physicians also listed their own profession as responsible for most of medication reconciliation stages, especially in the collection of BPMH at hospital discharge (90.9%), documentation in medical records at all transition points and patient guidance at hospital discharge (90.9%). Nurses, on the other hand, assigned greater responsibility for conducting medication reconciliation for pharmacists and physicians. The exception was guidance at hospital discharge, in which they shared responsibility: physicians (78.6%), nurses (71.4%) and pharmacists (71.4%) (Table A.5).

#### 4. Discussion

To our knowledge, this is the first multicenter study that assesses a perception of nurses, pharmacists and physicians about medication reconciliation. Instruments that assess the perception of health team have been important for identifying potential barriers and facilitators to implementation of clinical services in hospitals, such as medication reconciliation (Al-hashar et al., 2015; Rose et al., 2017).

**Table A1**

Demographic characteristics of nurses, pharmacists and physicians participating in the multicenter study.

Characteristics	Nurse	Pharmacists	Physicians
<b>Gender, n (%)</b>			
Female	13	17	36
Male	1	1	8
<b>Age, mean <math>\pm</math> SD</b>	$33.6 \pm 3.5$	$34.4 \pm 8.5$	$33.8 \pm 9.1$
<b>Time since graduation</b>	$10.2 \pm 2.5$	$10.9 \pm 8.4$	$8.8 \pm 9.5$

**Table A2**

Profile of responses of nurses, pharmacists and physicians on the relationship between medication reconciliation and patient safety.

	Absent answers	Partial relationship	Total relationship	Total
<b>Professionals, n (%)</b>				
Pharmacists	–	4 (22.2)	14 (77.8)	18 (23.7)
Nurses	2 (14.3)	–	12 (85.7)	14 (18.4)
Physicians	1 (2.3)	7 (15.9)	36 (81.8)	44 (57.9%)
<b>Total, n (%)</b>	<b>3 (4.0)</b>	<b>11 (14.5)</b>	<b>62 (81.6)</b>	<b>76 (100)</b>

**Table A3**

Profile of the responses of nurses, pharmacists and physicians in hospitals regarding the medication reconciliation at hospital admission, internal transfers and hospital discharge from pediatric wards.

	Medication reconciliation on pediatric wards Hospitals A and B (n = 49)	Hospitals C and D (n = 27)
<b>Admission</b>		
Does not perform	0	2 (7.4%)
Performs	37 (75.5%)	22 (81.5%)
Unknown	5 (10.2%)	0
Did not answer	7 (14.3%)	3 (11.1%)
<b>Internal transfer</b>		
Does not perform	8 (16.3%)	4 (14.8%)
Performs	21 (42.8%)	16 (59.2%)
Unknown	13 (26.5%)	0
Did not answer	7 (14.3%)	7 (25.9%)
<b>Hospital discharge</b>		
Does not perform	5 (10.2%)	0
Performs	31 (63.3%)	23 (85.2%)
Unknown	8 (16.3%)	1 (3.7%)
Did not answer	5 (10.2%)	3 (11.1%)

Most professionals who participated in this study considered medication reconciliation important for patient safety. This recognition can facilitate the acceptability of health team regarding the implementation of this service or changes in the work process of those hospitals where the service is implemented, in order to create a safe environment for patient care (Al-hashar et al., 2015; Van Sluiseveld et al., 2012). However, even if this understanding is valid, the realization of medication reconciliation in practice can be hindered by being a complex process that involves nurses, pharmacists and physicians as well as patients and their families, causing little value for this service (Al-hashar et al., 2015; Boockvar et al., 2011; Pevnick et al., 2016; Rose et al., 2017). To prevent this from happening, it is necessary to investigate the main barriers that interfere in the practice of medication reconciliation by different professionals, respecting the peculiarity of each scenario.

Similar to that found in the literature, it was possible to observe the unfamiliarity of some health professionals regarding the existence of medication reconciliation in the evaluated pediatric wards (Al-hashar et al., 2015; Boockvar et al., 2011; Van Sluiseveld et al., 2012). Similarly, it was observed in this study that some professionals stated the existence of medication reconciliation in places where this service is not offered. Two studies suggest that some professionals, in their usual practice, confuse some isolated or non-standardized practices of surveying the history of medication use and resolving discrepancies with the structured and institutionalized medication reconciliation service (Al-hashar et al., 2015; Van Sluiseveld et al., 2012). Therefore, the data obtained reinforce the need to conduct periodic training in these locations in order to raise awareness among the team about the importance of implanting and/or implementing the medication reconciliation service.

All professionals presented disagreements about the responsibility for conducting the five stages of medication reconciliation at different points of transition of care. Some authors justify that

**Table A4**

Profile of the responses of nurses, pharmacists and physicians about the professionals who perform the different stages of medication reconciliation in the pediatric wards from hospitals A and B.

Perceptions about professionals who perform the stages of medication reconciliation			
	Professionals from hospitals A and B (n = 49)		
	Nurses	Pharmacists	Physicians
<b>Professional who performs the collection of BPMH in their hospital n (%)*</b>			
Admission	20 (40.8)	31 (63.3)	31 (63.3)
Internal transfer	13 (26.5)	16 (32.7)	19 (38.8)
Hospital discharge	6 (12.2)	20 (40.8)	20 (40.8)
<b>Professional who analyzes and classifies discrepancies in their hospital n (%)*</b>			
Admission	7 (14.3)	22 (44.9)	15 (30.6)
Internal transfer	6 (12.2)	11 (22.4)	13 (26.5)
Hospital discharge	5 (10.2)	14 (28.6)	15 (30.6)
<b>Professional who resolves unintentional discrepancies in their hospital n (%)*</b>			
Admission	12 (24.5)	27 (55.1)	20 (40.8)
Internal transfer	10 (20.4)	15 (30.6)	18 (36.7)
Hospital discharge	9 (18.4)	20 (40.8)	20 (40.8)
<b>Professional who documents the medication reconciliation in their hospital's medical records n (%)*</b>			
Admission	7 (14.3)	20 (40.8)	23 (46.9)
Internal transfer	12 (24.5)	15 (30.6)	25 (51.0)
Hospital discharge	5 (10.2)	14 (28.6)	21 (42.9)
<b>Professional who advises the caregiver/patient on changes in their pharmacotherapy from the moment of admission to hospital discharge n (%)*</b>			
Hospital discharge	9 (18.4)	22 (44.9)	19 (38.8)

\* Percentages did not add up to a 100% by the reason of more than one answer was allowed.

unfamiliarity of the roles of each professional within the health team can cause communication problems and hinder collaborative practices that optimize patient care (Garth et al., 2018; Van Sluisveld et al., 2012). Among other factors, this can be explained due to the fact that interprofessional communication is not sufficiently fostered during undergraduate health programs in Brazil (Araújo et al., 2019; Liberali et al., 2018). However, other studies reinforce the need to invest in training “with, from and about” interprofessional collaboration from undergraduate programs to residency, which can reinforce the idea of complementarity and synergy of the health team's actions (Anderson et al., 2017; Brock et al., 2013; Hayward et al., 2000).

In this study, the non-existence of consensus about role and work process of each profession in medication reconciliation can

influence negative outcomes (Rose et al., 2017; Van Sluisveld et al., 2012). In this context, Boockvar et al. (2011) suggested dividing the stages of medication reconciliation as follows: (1) nurses would be responsible for collecting all sources of information on the patient's use of medicines; (2) pharmacists would analyze the discrepancies and document the history of medication use; and (3) physicians would solve the problems encountered by the two professionals. Thus, in the same way as in the study conducted by Al-hashar et al. (2015), it is necessary that each hospital aligns the medication reconciliation through references and consensus that define the roles and work processes of each profession, making the service more productive.

The survey about perceptions of nurses, pharmacists and physicians in this study suggests that the greater organization of each stage of medication reconciliation at all points of care transition enables the sharing and integration of information obtained from patients, avoiding unnecessary overload or duplication of tasks (Al-hashar et al., 2015). Based in an organized division of roles and responsibilities for medication reconciliation, the interprofessional team responsible for care must establish alliances capable of optimizing resources and achieving better health outcomes (Hayward et al., 2000; Morley and Cashell, 2017; Gittell et al., 2013).

As in other studies, failures in communication and interprofessional relationships may have caused more doubts about the medication reconciliation and the positive results that this service can generate (Garth et al., 2018; Manias et al., 2016; Silvestre et al., 2017). Therefore, it is necessary to stimulate interprofessional relationships and communication in order to improve the results of pharmacotherapy and minimize the costs of health systems.

## 5. Strengths and limitations

This work is the first multicenter study in Brazil that evaluates the perceptions of professional nurses, pharmacists and physicians regarding the medication reconciliation during the transition of care in pediatric wards of hospitals. This survey was conducted using a previously validated instrument. The results of this work can also be an opportunity to define the different roles of the three professionals. As in any study, this was not without limitations. The low rate of respondents, mainly from nursing professionals, was our main limitation. In some hospitals, some health

**Table A5**

Opinions of nurses, pharmacists and physicians about the professionals who should perform the medication reconciliation in the pediatric wards of hospitals A, B, C and D.

Perceptions about professionals who should perform the stages of medication reconciliation									
	Nurses (n = 14)			Pharmacists (n = 18)			Physicians (n = 44)		
	Physicians	Nurses	Pharmacists	Physicians	Nurses	Pharmacists	Physicians	Nurses	Pharmacists
<b>Professional who should collect BPHM at their hospital n (%)*</b>									
Admission	12 (85.7)	11 (78.6)	12 (85.7)	10 (55.6)	11 (61.1)	15 (83.3)	38 (86.4)	27 (61.4)	28 (63.6)
Internal transfer	12 (85.7)	9 (64.3)	12 (85.7)	11 (61.1)	8 (44.4)	17 (94.4)	39 (88.6)	23 (52.3)	19 (43.2)
Hospital discharge	12 (85.7)	7 (50.0)	9 (64.3)	10 (55.6)	3 (16.7)	16 (88.9)	40 (90.9)	16 (36.4)	24 (54.5)
<b>Professional who should analyze and classify discrepancies in their hospital n (%)*</b>									
Admission	11 (78.6)	7 (50.0)	11 (78.6)	5 (27.8)	4 (22.2)	16 (88.9)	36 (81.8)	19 (43.2)	26 (59.1)
Internal transfer	13 (92.9)	7 (50.0)	11 (78.6)	9 (50.0)	4 (22.2)	15 (83.3)	39 (88.6)	20 (45.5)	21 (47.7)
Hospital discharge	11 (78.6)	7 (50.0)	9 (64.3)	9 (50.0)	4 (22.2)	15 (83.3)	38 (86.4)	13 (29.5)	23 (52.3)
<b>Professional who should intervene to resolve unintentional discrepancies in their hospital n (%)*</b>									
Admission	13 (92.9)	9 (64.3)	12 (85.7)	7 (38.9)	3 (16.7)	15 (83.3)	38 (86.4)	21 (47.7)	26 (59.1)
Internal transfer	13 (92.9)	8 (57.1)	12 (85.7)	18 (100.0)	5 (27.8)	16 (88.9)	39 (88.6)	23 (52.3)	24 (54.5)
Hospital discharge	12 (85.7)	5 (35.7)	10 (71.4)	9 (50.0)	2 (11.1)	15 (83.3)	37 (84.1)	15 (34.1)	22 (50.0)
<b>Professional who should document the medication reconciliation in their hospital's medical records n (%)*</b>									
Admission	12 (85.7)	6 (42.9)	10 (71.4)	10 (55.6)	7 (38.9)	16 (88.9)	40 (90.9)	15 (34.1)	24 (54.5)
Internal transfer	13 (92.9)	4 (28.6)	11 (78.6)	13 (72.2)	7 (38.9)	16 (88.9)	40 (90.9)	20 (45.5)	22 (50.0)
Hospital discharge	9 (64.3)	6 (42.9)	8 (57.1)	12 (66.7)	1 (5.6)	11 (61.1)	41 (93.2)	14 (31.8)	22 (50.0)
<b>Professional who should guide the caregiver/patient about changes in their pharmacotherapy from the moment of admission until discharge. n (%)*</b>									
Hospital discharge	11 (78.6)	10 (71.4)	10 (71.4)	10 (55.6)	2 (11.1)	15 (83.3)	40 (90.9)	14 (31.8)	21 (47.7)

Percentages did not add up to a 100% by the reason of more than one answer was allowed.



professionals were unavailable to answer the printed or online instrument.

## 6. Conclusion

The data obtained show that the participating professionals have doubts about the stages of medication reconciliation, consequently, it must be better clarified, avoiding unnecessary work and improving communication among nurses, pharmacists and physicians. Therefore, it is necessary to stimulate interprofessional training since graduation to define roles and work processes as well as to introduce strategies that encourage work and improve the knowledge, collaboration, and productivity of the health team. Besides, the effective interprofessional communication is crucial for medication reconciliation, especially for pediatric patients. Hence should be a priority for mitigate medication errors in this population.

The instrument used was essential to assess the perception of professionals and other institutions may use it to conduct a better way to implement medication reconciliation. This study could be a reference for the implementation of medication reconciliation in these institutions to improve safety and optimize pediatrics patients' clinical results.

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## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jsps.2020.09.009>.

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