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Implantation of a Medication Reconciliation Model upon Admission to a Pediatric Hospital

Clara Meneses Mangas*; Dolores Pilar Iturgoyen-Fuentes; Margarita Cuervas-Mons Vendrell

Department of Pharmacy, University Children's Hospital Niño Jesús, Madrid, Spain.

***Corresponding Author(s): Clara Meneses Mangas**

Pharmacist specialized in Hospital Pharmacy , Pharmacy Hospital, University Children's Hospital Niño Jesús, Avda Menendez Pelayo 65, 28009-Madrid, Spain.
Tel: +34-91-5035900;
Email: claramenesesmangas@gmail.com

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Abstract

Background: The implantation of an Medication Reconciliation (MR) process has been shown to significantly reduce ME in the adult population. Although MR is an increasingly consolidated activity in adults, the same cannot be said of the pediatric population, which is a group particularly at risk of suffering ME.

Aim of the review: To implant a MR model in pediatric patients as a high-risk population, in order to reduce Medication Errors (MEs) upon hospital admission.

Method: The project was carried out in a pediatric hospital between January-November 2018 by a pharmacist specialized in Hospital Pharmacy. A daily list was compiled of the patients admitted in the last 24 hours, and in each case the Best Possible Medication History (BPMH) was obtained for comparison against the treatments actually prescribed upon admission, with the aim of analyzing possible discrepancies. Pharmaceutical Interventions (PIs) were moreover carried out to avoid MEs.

Results: A total of 1760 patients (45% females and 55% males, mean age 7.9 ± 5.2 years; range 12 days-24 years) were reconciled. Sixty percent presented background disease. Fourteen percent received more than four drugs in home treatment (range 4-15), including some drug with a Narrow Therapeutic Index (NTI). A total of 830 discrepancies were detected in the prescriptions of 592 patients (34%). Of these, 307 (37%) were justified by the clinical condition of the patient, while 523 (63%) were not justified and were classified as Reconciliation Error (RE). These REs were detected in 334 patients (56%). The main drug groups involved were psycholeptics and psychoanaleptics (n= 58), antiepileptic drugs (n=57) and systemic antibacterials (n=51). A total of 460 PIs were made, of which 72% received immediate acceptance.

Conclusion: Medication reconciliation in pediatrics is able to detect a significant percentage of errors, preventing them from reaching the patient.

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Impact on Practice: Our study shows that MR in pediatrics, in the same way as in adult patients, is useful for the detection of MEs, preventing them from reaching the patient. Fifty-six percent of peadiatric patients has at least one reconciliation error. The main drug groups involved were psycholeptics and psychoanaleptics.

Introduction

Patient safety is a priority concern and a key aspect of healthcare. The use of drugs is a complex process in which Medication Errors (MEs) may occur. These are defined as any avoidable incident that can cause harm to the patient or give rise to inappropriate drug use, when medication is under the control of the medical professional, the patient or consumer. Such MEs have a great impact upon patients in terms of morbidity-mortality and occur particularly during patients transition from one healthcare level to another. The ENEAS study [1] (National Study of Adverse Events), published in 2005 in Spain, showed 37.4% of the adverse events in hospitalized patients to be related to the prescribed medication. Likewise, the EVADUR study, conducted in the emergency care setting, found the second most frequent cause of adverse events to be medication practice [2].

For these reasons, world health institutions such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the World Health Organization (WHO) consider Medication Reconciliation (MR) to be one of the solutions to this problem. In this regard, MR is defined as the formal and standardized process of obtaining the complete list of the previous medications of patients for comparison against active prescription, with analysis and solution of the observed discrepancies in order to guarantee that the patients receive all the drugs needed for chronic treatment adapted to their current clinical condition and to the new prescriptions made upon hospital admission. Accordingly, the objective of MR is to detect and prevent ME, thereby increasing patient safety and the effectiveness of treatment [3,4]. According to the 2020 Initiative of the Spanish Society of Hospital Pharmacy (SEFH), "Towards the future, with safety", there should be standardized MR procedures upon admission and at discharge in all hospitals [5].

Different guides for the implantation of MR have been published in Spain, with recommendations on the need to incorporate a standardized system for compiling the information on all the patient drugs or contemplate the use of technological resources to facilitate the reconciliation procedure [6,7]. The Emergency Pharmaceutical Care working group (REDFASTER) found that 79% of the patients in the emergency care department presented discrepancies between the medication they were actually receiving before admission to the hospital emergency care department and the medication reflected in their case histories [8]. Furthermore, the abrupt suspension of certain drugs may result in withdrawal syndrome or exacerbation of the background disease, thereby complicating the acute condition leading to admission to emergency care, or even generating a new health problem. The criteria of the REDFASTER for a patient in the emergency care department to be regarded as a candidate for reconciliation are [9]:

- Admission to emergency care for over 24 hours, with the existence of routine home treatment.

- Estimated admission to emergency care for less than 24 hours but with the existence of routine treatment involving drugs that should be reconciled in a period of under four hours (Table 1).

The implantation of an MR process has been shown to significantly reduce ME in the adult population, and in this regard the hospital pharmacist is the professional best suited for carrying out the process [10,11]. Different authors consider that given the knowledge and experience of hospital pharmacists, these professionals should be in charge of leading MR [12], and can contribute to improve the clinical and economic outcomes [13-17]. Other authors affirm that in view of the evidence on the benefits of MR in patients, reconciliation should be established as a priority activity on the part of hospital pharmacists [18].

Cornish et al., analyzed prescription practice in 151 adult patients admitted to Internal Medicine with at least four drugs as routine home treatment. They identified at least one unintended discrepancy in 53.6% of the patients – the most prevalent being the omission of some drug [19].

Although MR is an increasingly consolidated activity in adults, the same cannot be said of the pediatric population, which is a group particularly at risk of suffering ME. Furthermore, the likeliness that such errors will cause adverse events is up to three times greater than in the adult population [20-22]. This is due to the existence of risk factors inherent to the pediatric population: significant differences in body composition and physiology in children versus adults; differences in drug efficacy due to pharmacokinetic and pharmacodynamic characteristics; the complexity of drug dosing and administration in pediatrics; the fact that in most cases medications are used under indications different from those authorized and the intrinsic heterogeneity of the pediatric population. Recently, the Institute for Safe Medication Practices (ISMP) has edited a bulletin reflecting the need to adopt strategies for the prevention of ME in pediatrics [23].

Despite its importance, few data are found in the literature on MR in the pediatric population. Coffey et al. described the implantation of an MR program in the pediatric population upon admission to a tertiary hospital center, and found the greatest number of treatment discrepancies to occur in polymedicated (4 or more drugs) patients and in those receiving antiepileptic medication [24]. In a study carried out in four hospitals in the United Kingdom to assess the efficacy of MR upon admission in 244 pediatric patients, 45% of the latter were seen to present at least one unintended discrepancy [25].

A study carried out by the Department of Pediatrics of the Jordan University Hospital in 2018 involving 100 pediatric patients conducted MR at the time of admission. At least one discrepancy was identified in 13% of the patients – the most common situation being the omission of some drug [26]. In view of the repercussion of MR in relation to patient safety and its relevance in a high-risk group such as the pediatric population, the development of an MR model specifically targeted to pediatric patients is required, in the same way as has been done in adults, with the purpose of ensuring that all healthcare centers with a pediatric area incorporate such activities in order to improve the safety of these patients.

Aim of the review

Primary objective

To adopt an MR model upon hospital admission in pediatrics in order to detect ME and thus improve the safety of pediatric patients.

Secondary objectives

To determine and analyze the discrepancies found between home treatment and the treatment prescribed upon admission; the drug groups implicated in such discrepancies; the background diseases in those patients in which Reconciliation Errors (Res) are detected; and the pharmaceutical interventions carried out to resolve the discrepancies and thus avoid ME.

To develop an algorithm for the identification of pediatric patients with a priority indication of MR.

Ethics approval

All the procedures performed in this study, which involved human participants, were conducted in accordance with the ethical standards of the institutional and Spanish research committees, with the 1964 Helsinki declaration and its later amendments, or with comparable ethical standards. Informed consent from patients was obtained at the clinical interview performed by the pharmacist in the Hospitalization Unit where the patient was admitted. The data were anonymized for analysis and only the researchers had access to the password-protected database. The participants were identified by a sequential numerical code. The acquired information regarding participants was treated confidentially. The treatment of the data was carried out in accordance with Organic Law 03/2018 and European Regulation (EU) 2016/679, on the Protection of Personal data.

Methods

The project was carried out in a pediatric hospital between January-November 2018 with the collaboration of the Pryconsa® Foundation. We included all patients admitted to the hospital during the study period, except those meeting any of the following exclusion criteria: psychiatric patients, subjects with an estimated duration of admission of under 24 hours, cases in which the clinical interview with the patient and/or caregiver was not possible, and patients in the emergency care department.

The pharmacist in charge obtained a list of the patients admitted in the last 24 hours based on the electronic prescription module of Farmatools®. Data compilation was made on a continuous basis on working days from 9 a.m. to 2 p.m. The list was obtained on Mondays, taking into account the admissions of the last 72 hours.

The Best Possible Medication History (BPMH) [15] was obtained for each patient included in the study. The BPMH included the complete medication of the patient throughout the healthcare process at both ambulatory (chronic medication) and hospital level (medication during admission). It also included the history referred to over-the-counter medications (publicity products, herbal remedies, homeopathic or parapharmacy products, etc.), patient adherence to treatment, and drug allergies.

The information sources used to obtain the BPMH were

- Electronic case history (HCIS®), with a detailed review of the available reports referred to patient hospital admission episodes and surgeries or nursing care.

- Primary care clinical/prescription history (HORUS®), reviewing the available reports referred to hospitalization episodes in other centers of the Community of Madrid, primary care reports, and active patient prescriptions.

- Clinical interview with the patient or caregiver. The pharmacist visited the hospitalization unit to which the patient was admitted in order to conduct a clinical interview with the patient or caregiver, asking questions referred to current home treatment, adherence to therapy and possible drug allergies or intolerances.

The following variables were recorded for each reconciled patient: date of admission, date of reconciliation, age, gender, reason for admission, background disease, drug allergies or intolerances, number of home drugs (with polymedication being defined as the use of 4 or more drugs), drugs with a Narrow Therapeutic Index (NTI) (Table 2), phytotherapeutic or homeopathic treatments, patient pertaining to the Community of Madrid, updating of treatment prescribed in HORUS®, discrepancies, number of discrepancies per patient, type of discrepancy, Pharmaceutical Intervention (PI), type of PI, resolution of discrepancy, drug implicated in the discrepancy, and drug class implicated in the discrepancy.

The background diseases were classified as: pediatric common diseases, neurological, oncohematological, mitochondrial and psychiatric disorders, asthma, autoimmune diseases, digestive, metabolic, endocrine, genetic and renal diseases, hematological disorders and cystic fibrosis. The drug classes implicated in the discrepancy were registered according to the Anatomic, Therapeutic, Chemical (ATC) classification of the Spanish Medicines Agency (AEMPS).

Once the BPMH of each reconciled patient was obtained, an analysis was made of the possible discrepancies between it and the treatment prescribed upon admission. The pharmacist compared the BPMH against the available treatment instructions, taking into account the current clinical situation of the patient, the justification of the prescriber, and the drug treatment indications.

The discrepancies were classified based on the medication reconciliation terminology and classification consensus document of the Spanish Society of Hospital Pharmacy as either justified or unjustified the latter being taken to represent Reconciliation Error (RE) and therefore capable of leading to ME [27].

The following were regarded as justified discrepancies: medical decision not to prescribe a drug or to modify its dose, frequency or administration route in accordance to the new clinical situation; medical decision to modify drug posology or administration route in accordance to the new clinical situation; introduction of a new medication justified by the clinical situation; therapeutic substitution according to the hospital center pharmacotherapeutic guide and therapeutic exchange programs. In turn, unjustified discrepancies (and therefore Res) were classified into the following groups: omission, commission, different dose, administration route or frequency of a drug, duplicity, interaction, maintenance of a medication in a situation in which it is contraindicated, and incomplete prescription.

Pharmaceutical Intervention (PI) represented the last step in the MR process, and the physician in charge was informed of the REs detected through the electronic prescription system. The most urgent or important PI was also reported verbally. Subsequently, confirmation of the resolution of the RE was made by reviewing the patient treatment order. Lastly, the data obtained in the MR process were entered in the MS Excel database designed for the study.

The analysis of the data was performed using the Stata v.13 statistical package in the Methodology Unit of the Instituto de Investigación Princesa (IP). A descriptive analysis was made, with the calculation of central tendency (mean and/or median) and dispersion measures (Standard Deviation [SD] and/or percentiles).

Results

During the 11 months of the study, MR was carried out in 1760 patients (45% females and 55% males), with a mean age of 7.9 ± 5, 2 years (range 12 days - 24 years) and a mean body weight of 28.9 ± 18.6 kg (range 3.2-114.2). Sixty percent of the patients had some background disease, the most common being neurological disorders, present in 18% of the patients (Table 3).

Most of the patient admissions were to medical units (60% versus surgical units in 40%).

On analyzing the type of home treatment, 14% of the cases (237 patients) were considered to be polymedicated, with an average of 6 drugs per patient (range 4-15). Approximately the same number of patients (n=251) had some NTI drug included in their routine home treatment, and only 1.7% used phytotherapy or homeotherapy.

Eighty percent of the study sample consisted of patients pertaining to the Community of Madrid, and of these, 39% did not have up to date information on their home medication in HORUS®.

In 592 patients we detected at least one discrepancy between home treatment and the treatment prescribed upon admission (Table 4). The total number of discrepancies detected was 830, of which 307 (37%) were justified and 523 (63%) unjustified (and thus represented RE), affecting 334 patients (56%). On analyzing the REs, most were seen to be due to omission (77%), followed by different dose, administration route or frequency (17%) (Table 5). Thirty-two percent of the patients with RE suffered background neurological disease, fundamentally epilepsy, and 16% presented oncohematological disease (Table 6).

Most of the patients with RE were admitted to medical units (56% versus surgical units in 43%).

Of the patients in which REs were detected, 34% (n=112) were polymedicated, with an average of 6 drugs per patient (range: 4-13) and 30% (n=99) had some NTI drug in their home treatment. The main drug groups implicated in the detected REs corresponded to psycholeptics and psychoanaleptics (n=58), antiepileptic drugs (n=57) and systemic antibacterials (n=51) (Table 7).

In order to avoid MEs, a total of 460 PIs were carried out. Of these, 76% aimed to start regular treatment that had been omitted upon admission. The degree of acceptance of the PIs on the part of the healthcare professionals was 72% (Table 8).

Table 1: Drugs with a reconciliation time of under four hours [8].

– OADs, if multiple daily doses
– Alpha-adrenergic agonists (clonidine, methyldopa, moxonidine)
– Beta-adrenergic agonists, ipratropium bromide and inhaled corticosteroids
– Antiarrhythmic drugs (amiodarone, quinidine, disopyramide, dronedarone)
– Antibiotics
– Antiepileptic drugs and anticonvulsivants (phenytoin, carbamazepine, valproic acid, oxcarbazepine, phenobarbital, pregabalin, topiramate)
– Antiretrovirals
– Azathioprine
– Beta-blockers
– Calcium antagonists
– Cyclophosphamide
– ACEIs or ARA-II, if multiple daily doses
– Leukotriene inhibitors (montelukast, zafirlukast)
– Insulin
– Methotrexate
– Nitrates
– Ocular therapy

OAD: Oral Antidiabetic Drugs; Aceis: Angiotensin Converting Enzyme Inhibitors; ARA-II: Angiotensin II Receptor Antagonists.

Table 2: Drugs with a narrow therapeutic index (Modified from AEMPS [28]).

Drug Substance	Pharmacotherapeutic Class
Sirolimus	Immunosuppressors
Tacrolimus	Immunosuppressors
Warfarin	Oral Anticoagulants
Flecainide	Antiarrhythmic Drugs
Carbamazepine	Antiepileptic Drugs
Everolimus	Immunosuppressors
Cyclosporine	Immunosuppressors
Digoxin	Cardiotonic Agents
Phenytoin	Antiepileptic Drugs
Levothyroxine	Thyroid Drugs
Acenocoumarol	Oral Anticoagulants
Theophylline	Antiasthmatic Drugs
Valproic Acid	Antiepileptic Drugs
Phenobarbital	Antiepileptic Drugs
Gentamycin	Antibacterials
Amikacin	Antibacterials
Vancomycin	Antibacterials
Methotrexate	Antineoplastic Drugs

Table 3: Demographic and clinical characteristics of the study sample (n=1760).

Variables	Total	%
Age (years) Mean±SD (Range)	8 12 days-24 years	
Gender		
Female	788	45
Male	972	55
WEIGHT (kg)		
Mean±SD	28.9 ± 18.6	
(Range)	(3.2 - 114.2)	
AGE GROUP		
- Neonate (up to 29 days)	6	0.3
- Infant (1 month-1 year)	113	6
- Pre-school (>1 year-5 years)	630	36
- School (>5 years-12 years)	633	36
- Adolescent (5-18 years)	378	21
Background disease		
- No background disease	703	40
- Neurological	318	18
- Mitochondrial	9	0.5
- Oncohematological	218	12.5
- Psychiatric	42	2.4
- Common pediatric	151	9
- Asthma	69	4
- Autoimmune	35	2
- Gastrointestinal	33	1.9
- Genetic	20	1
- Renal	37	2
- Hematological	30	1.7
- Multiple disease (≥ 2)	7	0.5
- Cystic fibrosis	15	0.9
- Endocrine	15	0.9
- Metabolic	16	1
- Cardiovascular	3	0.2
- Others	27	1.5
Polypharmacy (≥ 4 drugs)		
Yes	237	14
No	1523	86
No. of drugs as regular treatment in polypharmacy		
Mean+SD	6.06 ± 2.3	
(Range)	(4-15)	
Phytotherapy/homeopathy		
Si	30	2
No	1730	98
Allergies/intolerances		
Yes	75	4
No	1685	96
NTI drugs		
Yes	251	14
No	1509	86
Patient of the Community of Madrid		
Yes	1401	80
No	359	20
Up-to-date treatment HORUS		
Yes	850	61
No	551	39
Department of admission		
Pediatrics	506	29
Neurology	144	8
Traumatology	329	19
Pediatric surgery	169	10
Medical oncology	161	9
Neurosurgery	98	6
Palliative care unit	18	1
Ophthalmology	12	0.7
Nephrology	38	2
Otorhinolaryngology	28	1.6
Stomatology	5	0.3
Rheumatology	4	0.2
Endocrinology	17	1
Urology	41	2
Hematology	20	1
Pneumology	8	0.5
Intensive care	73	4
Dermatology	3	0.2
Buccodental unit	3	0.2
Plastic surgery	32	2
Digestive diseases	34	2
Cystic fibrosis unit	14	0.8
Emergency care	2	0.1
Allergy	1	0.1

Table 4: Classification of the patients according to the presence or absence of discrepancies.

	Number of Patients	%
Discrepancies	592	34
- Justified	258	44
- Reconciliation Error (RE)	334	56
Without discrepancies	1168	66
Total	1760	100

Table 5: Classification of the discrepancies.

Type Of Discrepancies	Number Of Discrepancies	Percentage Of Total Discrepancies
Justified	307	37
- Medical decision not to prescribe a drug based on new clinical situation	246	80
- Medical decision to modify drug dose or administration route based on new clinical situation	36	12
- Others	25	8
UnJustified (RE)	523	63
- Omission of medication	401	77
- Different dose, administration route or frequency of a drug	88	17
- Others	34	7

Table 6: Demographic and clinical characteristics of the patient with reconciliation error (n=334).

Variables	Total	%
Background disease		
- No background disease	26	8
- Neurological	107	32
- Mitochondrial	4	1
- Oncohematological	52	16
- Psychiatric	24	7
- Common pediatric	10	3
- Asthma	25	8
- Autoimmune	9	3
- Gastrointestinal	12	4
- Genetic	9	3
- Renal	9	3
- Hematological	9	3
- Multiple disease (≥ 2)	3	1
- Cystic fibrosis	11	3
- Endocrine	7	2
- Metabolic	9	3
- Others	7	2
Polypharmacy (≥4 drugs)		
Yes	112	34
No	222	66
No. of drugs as regular treatment in polypharmacy		
Mean + SD	6.22 ± 2.24	
(Range)	(4-13)	
Phytotherapy/homeopathy		
Yes	8	2
No	326	98
Allergies/intolerances		
Yes	35	10
No	299	90
NTI drugs		
Yes	99	30
No	235	70
Patient of the Community of Madrid		
Yes	250	75
No	84	25
Up-to-date treatment HORUS		
Yes	93	37
No	157	63
Department of admission		
- Medical	188	56
-Surgical	146	44
Pediatrics	46	14
Neurology	29	9
Traumatology	81	24
Pediatric surgery	22	7
Medical oncology	32	10
Neurosurgery	26	8
Palliative care unit	8	2
Ophthalmology	4	1
Nephrology	13	4
Otorhinolaryngology	3	1
Stomatology	1	0.3
Rheumatology	1	0.3
Endocrinology	2	1
Urology	5	2
Hematology	3	1
Pneumology	2	0.6
Intensive care	26	8
Dermatology	2	0.6
Buccodental unit	2	0.6
Plastic surgery	3	1
Digestive diseases	11	3
Cystic fibrosis unit	11	3
Emergency care	1	0.3

Table 7: Distribution of reconciliation errors according to drug class (ATC classification).

Drug Class	Total Reconciliation Errors	% Of Total Reconciliation Errors
A01 Stomatological drugs	2	0.4
A02 Agents for the treatment of alterations caused by acids	29	6
A03 Agents for functional stomach and intestinal disorders	1	0.2
A04 Antiemetics and anti- nausea drugs	4	1
A05 Biliary and hepatic therapy	2	0.4
A06 Laxatives	8	2
A09 Digestive enzymes	5	1
A10 Drugs used in diabetes	1	0.2
A11 Vitamins	44	9
A12 Minerals	22	4
A15 Appetite stimulators	2	0.4
A16 Other agents for the gastrointestinal tract and metabolism	14	3
B03 Anti-anemia agents	22	4
B05 Substitutes of plasma and solutions for infusion	2	0.4
C01 Cardiac therapy	4	1
C02 Antihypertensive drugs	4	1
C03 Diuretics	2	0.4
C09 Agents acting upon the renin-angiotensin system	2	0.4
D01 Antifungals for dermatological use	1	0.2
D06 Antibiotics and chemotherapeutic agents for dermatological use	1	0.2
D07 Dermatological agents with corticosteroids	1	0.2
G03 Sex hormones and hormone modulators	4	1
G04 Urological drugs	12	2
H01 Hypothalamic and pituitary hormones and their analogs	10	2
H02 Systemic corticosteroids	8	2
H03 Thyroid therapy	8	2
J01 Systemic antibacterials	51	10
J02 Systemic antifungal agents	4	1
J04 Antimycobacterial drugs	1	0.2
J05 Systemic antiviral drugs	2	0.4
L01 Antineoplastic agents	3	1
L04 Immunosuppressors	3	1
M03 Muscle relaxants	12	2
M05 Drugs for bone diseases	1	0.2
N01 Anesthetics	1	0.2
N02 Analgesics	1	0.2
N03 Antiepileptic drugs	57	11
N04 Antiparkinson agents	2	0.4
N05 Psycholeptics	30	6
N06 Psychoanaleptics	28	6
N07 Other nervous system drugs	2	0.4
R01 Nasal formulations	13	3
R03 Agents for obstructive airway diseases	54	11
R05 Cough and common cold formulations	1	0.2
R06 Systemic antihistamines	9	2
S01 Ophthalmological drugs	7	1
V03 All other pharmacotherapeutic groups	2	0.4
Dietetic formulations	5	1
Others	19	4

Table 8: Pharmaceutical interventions.

Reason For Pi	Total (n = 460)	%
- Drug not indicated	5	1
- Therapeutic duplicity	2	0.4
- Prevention of adverse reaction	2	0.4
- Drug not included in pharmacotherapeutic guide	1	0.2
- Excessive dose	20	4
- Insufficient dose	37	8
- More frequent than recommended	5	1
- Less frequent than recommended	3	1
- Regular treatment not prescribed and necessary	351	77
- Incomplete medical order	4	1
- Detection of error/incongruence	15	3
- Transcription error	5	1
- Others	8	2

Discussion

The results of our study show that 34% of the patients had at least one discrepancy in their treatment, and that 18% presented RE that could have resulted in ME. These figures are similar to those published by Abu Farha et al., with RE in 13% of their cases [26], and lower than those obtained by Huynh et al., who found 45% of their patients to have at least one unintended discrepancy [25]. The comparison of our results with those of other authors is complicated due to the fact that there are few studies in the literature on MR in the pediatric population, and the lack of uniformity of the terminology used. To the best of our knowledge, the present study represents the first published experience with the implantation of a medication reconciliation model in the pediatric population at national level. In order to avoid ME, a total of 460 PIs were carried out by a hospital pharmacist. This is consistent with the data published by other authors regarding increased patient safety thanks to the MR made by a hospital pharmacist [16].

As in other studies of MR in both adults and the pediatric population [10,11,24,26], the most common RE was the omission of some drug (39% of all REs), followed by incorrect prescription of drug dose, administration route or frequency (10% of all REs). One of the reasons for this could be the lack of up-to-date and easily accessible information regarding the home treatments of the patients at the time of admission to hospital. This is supported by our own experience, since 39% of the home treatment specifications of the reconciled patients pertaining to the Community of Madrid did not coincide with the information available in HORUS®.

In turn, we found a possible relationship between the number of drugs used by the patient at home and the presence of RE upon admission – a larger number of drugs being associated to a greater probability of RE. These results are consistent with the published observations in adults, where polypharmacy was likewise established as one of the main risk factors for RE [10,11].

It is important to underscore that to the best of our knowledge, this is the first study to analyze RE according to the type of pediatric patient. In this regard, the main groups of patients in which REs were detected corresponded to those with neurological, oncohematological and severe respiratory diseases. Reconciliation errors were less frequently identified in other groups of patients such as those with autoimmune disorders, metabolic diseases, cystic fibrosis or non-oncological hematological diseases. Due to the complexity of these patients and the importance of correct pharmacological treatment, we consider that patients of this kind should also be included among those amenable to reconciliation.

In order to guarantee the safety of pediatric patients, we also analyzed the drugs most often implicated in RE. In this regard, the drug classes most commonly implicated in RE were antiepileptic drugs, psychoanaleptics and psycholeptics, and systemic antibacterials. These results are consistent with those of other studies in adult patients, where these same drug classes were seen to be those most often implicated in RE [10].

The high percentage of PIs accepted by the medical team following the detection of RE (76%) reflects the importance of MR for the prevention of ME, and thus for ensuring increased safety of pediatric patients during hospital admission.

Our results show that REs are common in the pediatric population and that the implantation of an MR model upon admission would allow us to detect them before they affect the patient. Based on the results obtained, we attempted to identify the main characteristics of those pediatric patients at greatest risk of suffering RE, as well as the drug classes most often implicated in such errors. These data could help us to select the patients, assigning priority MR to those individuals that stand to benefit most or which could be most susceptible to ME, with a view to reinforcing their safety during hospital admission.

On considering the background disease of the patient, MR should focus on chronic pediatric patients with neurological, oncohematological or severe respiratory disorders, and on those receiving regular treatment with antiepileptic drugs, psycholeptics and/or psychoanaleptics and systemic antibacterials.

It would be advisable to conduct a study to confirm that patients with these characteristics effectively would be those deriving most benefit from reconciliation processes.

Among the limitations of our study, mention must be made of the lack of available resources for performing MR in all patients admitted from 3 p.m. onwards; the lack of evaluation of the clinical significance of RE as done in other studies in the pediatric population [25]; and the impossibility of assessing the acceptance of some PIs because the patient was discharged before verification of the resolution of the discrepancies.

It also would have been interesting to have a reference or control group without PI, in order to compare the intervention versus standard treatment.

A multicenter study with other pediatric hospitals would be advisable in order to more closely analyze patients with background diseases that are infrequent in our center (e.g., heart disease), since such a study would generate a more representative sample size allowing the drawing of more solid and extrapolatable conclusions.

Conclusion

Medication reconciliation in pediatrics, in the same way as in the adult population, has been shown to be useful in the detection of RE, contributing to prevent such errors from reaching the patient. The MR criteria in adults cannot be extrapolated to the pediatric setting; it therefore would be necessary to develop and validate an algorithm allowing the selection of those patients that stand to benefit most from MR, with the implantation of this activity in all centers that treat the pediatric population.

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