Comparison of a Pharmacist-Performed and Physician or Advanced Practice Provider-Performed Medication History in Pediatric Patients

Journal of Pharmacy Technology
2015, Vol. 31(5) 219–222
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sagepub.com/journalsPermissions.nav
DOI: 10.1177/8755122515578694
pharmatech.sagepub.com

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Abstract

Background: In the adult population, a high rate of discrepancies exists between provider-performed and pharmacist-performed medication histories. Limited data exist regarding pharmacist-performed medication histories in hospitalized pediatric patients. **Objective:** Identify the incidence and severity of discrepancies in medication histories performed by practitioners compared with pharmacists in the pediatric population. **Methods:** After institutional review board approval, a retrospective analysis of pediatric patients admitted to inpatient pediatric units in a tertiary hospital was performed. The primary endpoint of the study was the percentage of provider-performed medication histories with any discrepancies compared with the pharmacist-performed medication history. Secondary endpoints included the number and type of discrepancies and the discrepancy's potential risk of patient harm. **Results:** A total of 101 subjects were included. Nineteen patients (18.8%) had at least one medication discrepancy. Missing medications accounted for the majority of the discrepancies. Advance practice providers performed a small number of the initial medication histories (5%) and had at least one discrepancy for each history performed. The percentages of Grades 1, 2, and 3 discrepancies were 57.2%, 17.1%, and 25.7%, respectively. Medications with the most frequent discrepancies included anticonvulsants, antihistamines, and histamine receptor antagonists. Limitations include the retrospective nature of the study and lower than expected discrepancy rate. **Conclusion:** In this study, 18.8% of pediatric patients had a discrepancy between medication histories. Missing medications accounted for the largest amount of discrepancies. A large percentage of discrepancies had the potential to cause patient harm.

Keywords

medication history, medication reconciliation, pediatrics, admission medication history, pharmacist medication history

Introduction

A patient medication history is a list of all medications, doses, routes, and frequencies of administration.¹ A medication history can be obtained for each patient care encounter, such as a hospital admission or emergency department visit. Medication reconciliation is a process of comparing the medications a patient is taking or should be taking with newly ordered medications, both at time of admission and at each step across the continuum of care.² The reconciliation process addresses duplications, omissions, interactions, and the appropriateness of current medications. Potential information clinicians may obtain include medication name, dose, frequency, route, and indication. Resources clinicians utilize in obtaining medication histories and reconciliations may include previous patient records; interviews with the patient, family members, or other providers; the patient's outpatient

pharmacy records; and previous and current medication histories. A pharmacist may need to perform an additional medication history in order to ensure an accurate medication list is available for the medication reconciliation.

The benefits of a pharmacy-performed medication reconciliation process have been well documented in the adult population.³ Key aspects of successful intervention include

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Table 1. Grade for the Discrepancy's Potential Risk for Patient Harm as Detected by the Pharmacist Medication History⁸.

Grade	Description	Example
1	Unlikely to cause patient discomfort or clinical deterioration	Patient is prescribed atorvastatin calcium 20 mg daily on admission, despite reporting a home dosage of 10 mg/day
2	The potential to cause moderate discomfort or clinical deterioration	Patient prescribed atenolol 25 mg twice daily on admission, despite reporting a home dosage of 25 mg daily
3	The potential to result in severe discomfort or clinical deterioration	Patient admitted with gastrointestinal hemorrhage was ordered ramipril 2.5 mg daily on admission, but reported no prior use of ramipril during the interview

pharmacy staff collaboration and the targeting of high-risk patient populations. The benefits of pharmacist-performed medication histories and reconciliations in pediatric populations have not been well elucidated in the medical literature.^{4,6} From May 2006 through August 2007, Gardner and Graner documented 567 medication reconciliation-related interventions with the use of a tool to identify patients in need of medication reconciliation in a children's hospital.⁴ Over a 1-year span, Stone et al evaluated admission medication reconciliations in children with medically complex conditions.⁵ Thirty-nine errors were identified in 182 admission medications, 13 of which were found to have the potential to cause patient harm. Between September 2006 and March 2007, Terry et al analyzed pediatric patient medication reconciliations in the United Kingdom and found initial admission medication orders for children differed from prescribed preadmission medications in 39% of cases analyzed.⁶ In addition, limited data are available regarding the potential impact of errors from inaccurate medication histories in pediatric patients.⁷

At our institution, a tertiary pediatric hospital, decentralized pharmacists are involved in direct patient care with rounding responsibilities. Although no set credentialing program exists, all pharmacists are involved in the documentation of the medication history and reconciliation for admitted pediatric patients. Typically, practitioners perform the initial medication history and pharmacists later perform a medication history and reconcile the patient's home medications with their inpatient orders. The purpose of this study was to identify the incidence and severity of discrepancies in medication histories performed by practitioners compared with pharmacists in the pediatric population.

Patients and Methods

After institutional review board approval, a retrospective chart review was conducted of patients <19 years of age receiving care on 2 pediatric patient care floors or 1 pediatric intensive care unit between August 1 and October 30, 2012. Patients were excluded if they did not have a medication history from a physician or advanced practice provider (APP) in the electronic medical record, did not have an electronic medication history performed by a pharmacist, were transferred from another pediatric patient care area, or did not have any medications prior to admission as identified by the physician or APP and pharmacist.

The primary endpoint of the study was the percentage of physician- or APP-performed medication histories with at least one discrepancy as compared with the pharmacist-performed medication history. Assuming the proportion of patients with at least one discrepancy between the medication history performed by the physician or APP and the pharmacist-performed medication reconciliation was 25%, a sample size of 100 patients would provide a power of 99%. Secondary endpoints of the study included the number of discrepancies detected by the pharmacist medication history, the type of discrepancies (defined as incorrect medication, dose, route, frequency, incomplete information, or missing medications) detected by the pharmacist medication history, a relative grade for the discrepancy's potential risk for patient harm, and risk factors for medication discrepancies. The discrepancy's potential for harm was ranked according to the grading system developed by Cornish et al, as shown in Table 1.⁸ Risk factors analyzed for medication discrepancies included medication dosing formulation (oral tablet, oral suspension or solution, or injection), number of home medications (<5, 5-10, >10), and drug class of home medication as identified by the American Hospital Formulary Service pharmacologic-therapeutic classification system.⁹

Potential study patients were identified using a data repository. Potential patients were randomly selected using a random number generator tool, and the first 101 eligible subjects were included in the study. The medication histories obtained by physician, APP, and pharmacist were obtained from the patients' electronic medical records. Two pharmacists who were not directly involved with the medication reconciliation process or data collection independently classified each discrepancy for its potential to cause harm. Disagreements were resolved by the input of a third pharmacist. Descriptive statistics were used to describe the data. Paired *t* tests were used to compare data between groups.

Results

A total of 101 subjects were included in study. The average patient in this study was 8.47 years of age and had approximately 5 home medications. Results are presented in Table 2.

Table 2. Summary of Results.

Outcome	Number (%)
≥1 Discrepancy	
Yes	19 (18.8)
No	82 (81.2)
Number of discrepancies per patient	
0	82 (81.2)
1	9 (8.9)
2	6 (5.9)
3	2 (2.0)
4	2 (2.0)
Type of discrepancy	
Drug missing	20 (57.1)
Dosage missing	6 (17.1)
Drug frequency missing	5 (14.3)
Dosage and frequency missing	3 (8.6)
Drug, dosage, and frequency missing	1 (2.9)
Discrepancy rate by provider type	
Physician	13 (13.9)
APP	5 (100)
Medication formulations with discrepancies	
Oral, liquid	21 (60.0)
Oral, solid	10 (28.6)
Intravenous	2 (5.7)
Other	2 (5.7)

Abbreviation: APP, advanced practice provider.

Table 3. Grades of Observed Discrepancies.

	Number of Discrepancies
Grade 1	20
Grade 2	6
Grade 3	9
Total	35

Nineteen patients (18.8%) had at least one medication discrepancy identified. The total number of discrepancies identified in the study population was 35 and ranged from 0 to 4 discrepancies per patient. Missing medications accounted for the majority of the discrepancies identified (57.1%). Physicians performed the majority of the medication histories (95%) with an overall discrepancy rate of 13.9%. APPs performed few of the medication histories (5%) with at least one discrepancy in all histories performed as compared with the pharmacist. The percentages of the total discrepancies for Grade 1, Grade 2, and Grade 3 discrepancies were 57.2%, 17.1%, and 25.7%, respectively (see Table 3). The oral medication formulations accounted for the largest number of discrepancies (88.6%) and included both liquid (60%) and solid (28.6%) formulations. The number of home medications did not influence the likelihood of having a discrepancy. Medications with the

Table 4. Age and Number of Medications and Discrepancy Rate.

	≥1 Discrepancy	No Discrepancy
Age, years ^a	9.1 (7.5)	8.3 (6.2)
Total medications ^a	4.6 (2.7)	5.0 (4.4)
Number of medications		
<5	12 (17.9%)	55 (82.1%)
5-10	5 (22.7%)	17 (77.2%)
>10	2 (16.7%)	10 (83.3%)

^aData are presented as mean (standard deviation).

greatest number of discrepancies included anticonvulsants (11%), first-generation antihistamines (9%), second-generation antihistamines (9%), and histamine receptor antagonists (9%). Patients with at least one discrepancy were slightly older than patients who did not have any discrepancy (9 years vs 8 years, $P > .05$; see Table 4).

Discussion

This was the first study to identify the rate and grade of medication discrepancies between physician- or APP-performed and pharmacist-performed medication histories in pediatric patients. A total of 18.8% of patients had at least one discrepancy. This rate was lower than other studies evaluating medication histories and reconciliation in adults and pediatrics.^{1,5-7} Missing medications accounted for the largest proportion of all discrepancies in physician- and APP-performed medication histories. These discrepancies may be due to incomplete medication history interviews or a lack of focus on all of the patient's home medications. A physician or APP may not be focusing on documenting medications that do not directly relate to the provider's specialty or the patient's current medical condition. Additionally, the provider might not focus on over-the-counter medications and supplements. A pharmacist may be able to perform a more thorough medication history allowing them to document a larger number of medications given their focus on medication management. Over-the-counter medications and supplements accounted for a large proportion of the discrepancies reported (37.1%) and may not have been high priority medications to initiate in the inpatient setting.

This study also showed all medications histories performed by APPs were associated with at least one discrepancy. Although the number of APP medication histories included was very small (5 subjects), there was a clinically significant trend in these patients. More resources and education may be needed to increase the focus on providing accurate medication histories in the clinic setting by APPs.

A large percentage of discrepancies identified were Grade 2 (17%) or Grade 3 (26%). These discrepancies had the potential to cause moderate to severe discomfort or clinical deterioration. The discovery of these discrepancies by the pharmacist

may have had a meaningful impact on the patient's quality of care and the patient's outcome in the inpatient setting, although it was not possible to determine the tangible significance of these interventions. The oral liquid formulations accounted for the largest proportion of discrepancies. This is likely due to multiple compounded medications and confusion regarding volumes, concentrations, and doses of oral liquid medications. The number of home medications had no effect on the discrepancy rate. One potential reason for this lack of variation is patients with more home medications may have closer follow-up in the outpatient setting.

This study has several limitations. Given the retrospective nature, it is difficult to determine the true accuracy of each patient's medication history. The pharmacist's medication history was used as the correct history, but there is no way to ensure this was accurate. Furthermore, it is difficult to determine the clinical significance of these discrepancies. However, based on the high rates of Grades 2 and 3 discrepancies, there is a large potential for clinical significance. This study showed a smaller than predicted percentage of patients with at least one discrepancy in their medication histories; however, this percentage was still within the confidence interval of 16.92% and 24.6% as identified prior to the study. A post hoc analysis indicated the observed discrepancy rate still provided a power of 99%. Many factors could have led to this lower than predicted discrepancy rate, including input from a pharmacist or pharmacist-performed medication history prior to initial provider-performed medication history, or improper documentation of the pharmacist's medication history. Depending on the patient's time and date of admission, the patient's length of stay, and pharmacist staffing level, a pharmacist may not have been able to perform a thorough medication history for every patient. Also, a pharmacist may have performed a medication reconciliation only utilizing the medication history initially entered by the physician with the patient's current medication orders without performing their own patient or parent interview regarding the patient's home medications. Educating the pharmacy staff on the importance of a correct medication history and reconciliation may be one solution to making this task a priority in the pharmacist workload. Additionally, allocating more resources for thorough medication histories performed by pharmacists would allow for accurate patient medication histories and potentially have a positive significant impact on the patient.

Conclusion

Pharmacist-performed medication histories provided additional information not always captured by physician- and

APP-performed medication histories and may be beneficial by achieving a more complete medication history for pediatric patients. Although the number of medication discrepancies was less than anticipated for this study group, these discrepancies may have had a meaningful impact on the patient's quality of care and potentially the patient's outcome. Pharmacists are an integral component of establishing an accurate medication history in the inpatient setting for pediatric patients.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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