Prevalence and Clinical Significance of Medication Discrepancies at Pediatric Hospital Admission

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Objective.—To quantify admission medication discrepancies in a tertiary-care, general pediatric population, to describe their clinical importance and associated factors, and to assess a screening approach to pharmacist involvement.

Methods.—A total of 272 patients were studied prospectively at hospital admission. The study pharmacist performed a medication history and compared it to physicians' admission medication orders. Discrepancies between the 2 were coded as intentional but undocumented or unintentional. Unintentional discrepancies were rated for potential to cause harm by 3 physicians. Additional data collected included patients' reason for admission and presence of chronic conditions, whether physicians used a medication reconciliation form, the characteristics of patients' home medication regimen, and the time required to perform a pharmacist history and reconciliation. Interrater reliability and associations between baseline characteristics and discrepancy rates were explored.

Results.—Eighty patients (30%) had at least one undocumented intentional discrepancy (range, 0–7). At least one unintentional discrepancy (range, 0–9) was found in 59 patients (22%). Of the unintentional discrepancies, 23% had moderate and 6% had severe potential to cause discomfort or deterioration. Ratings were similar among the 3 physicians. Characteristics associated with higher risk of clinically important discrepancies were: use of the medication reconciliation form, ≥4 prescription medications, and antiepileptic drug use. Logistic regression revealed that only the variable ≥4 medications was independently associated with clinically important discrepancies.

Conclusions.—Admission medication errors are common in this tertiary-care, general pediatric population, and nearly a third represent potential adverse events. The use of a medication reconciliation form by physicians without pharmacist involvement does not appear to reduce errors. A cutoff of ≥4 prescription medications is highly sensitive for identifying patients at risk of clinically important discrepancies.

KEY WORDS: medication errors; pediatrics; pharmacists; prescriptions

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Medication errors are responsible for up to a quarter of adverse events in health care.[1] Hospital admission has been identified as a key vulnerability because a quarter of hospital prescribing errors are attributable to incomplete medication histories.[2] A systematic review of 22 adult studies revealed that 19% to 75% of discrepancies between home medications and admission medications were errors, as opposed to intentional omissions or changes.[3] A prospective study in adults revealed that 40% of unintentional discrepancies had moderate to severe potential to cause harm.[4]

Medication reconciliation has been promoted as a means to reduce admission medication errors.[5] It is defined as "the process of creating the most accurate list possible of all medications a patient is taking – including drug name, dosage, frequency and route – and comparing that list against the physician's admission, transfer, and/or discharge orders, with the goal of providing correct medications to the patient at all transition points."[6] The complete medication list, known as a best possible medication history, uses up to 8 sources of information, such as drug vials and community physicians or pharmacies.[7] Medication reconciliation identifies 2 kinds of discrepancies. Intentional but undocumented discrepancies occur when the prescriber intended for the admission order to deviate from the home regimen but did not document this intent, which could potentially lead to inadvertent discontinuation of medications at discharge.[8] In contrast, an unintentional discrepancy represents an error, either in taking the history or in order entry, such that the admission medication orders unintentionally deviate from the home regimen.[6]

Medication reconciliation has been shown to decrease discrepancy-related adverse drug events in some settings[9,10] and is endorsed by leading international patient safety organizations.[6,11,12] It is now a hospital accreditation requirement in both the United States and Canada.[13,14] In light of the potential resources necessary to implement and maintain medication reconciliation and the challenge of engaging physicians, data describing its effect on

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pediatric patients are essential. Numerous studies document rates, types, and severity of medication errors at admission in the adult population,[2–4] but similar data in a pediatric population are scarce despite growing interest in pediatric medication errors.[15–19] It is also critical to understand how to perform medication reconciliation efficiently. Although pharmacist-obtained medication histories may be considered the "gold standard,"[3,4,20] the varying availability of clinical pharmacists necessitates identification of high-risk patients for whom this resource should be allocated.

The primary objective of this study was to quantify discrepancies in medication orders at the time of admission. Our secondary objectives were to determine the clinical significance of unintentional discrepancies (ie, errors) and identify associated characteristics. Finally, by designing our data collection to mirror real-world medication reconciliation, we aimed to postulate the efficacy of this process in our setting and measure the workload involved. We hypothesized the following: 1) comprehensive medication histories performed by a clinical pharmacist are more accurate than standard physician histories as shown in adults[3,4,20]; 2) reconciliation can identify and correct clinically important unintentional discrepancies, thus preventing potential adverse events; and 3) a risk-based approach to medication reconciliation may be used to optimize the use of clinical pharmacist resources.

METHODS

Setting

This is a prevalence study on a consecutive sample of general pediatric admissions that uses methodology described by Cornish and colleagues.[4] The setting was a 60-bed general pediatrics unit within a 300-bed tertiary-care children's hospital in Toronto, Canada. Approximately 90% of admissions to the unit come from the emergency department. The unit is staffed by a combination of traditional teaching teams consisting of students, residents, and faculty as well as hospitalist-only teams, with after-hours admissions seen by residents and fellows. The unit cares for predominantly tertiary/quaternary patients because a redistribution system is in place to transport secondary-care patients to a community or regional center. Both the ward structure and the redistribution system have been evaluated and described in detail elsewhere.[21,22]

During the study period, the general pediatrics ward was in the early phase of implementing a medication reconciliation process that has since been described.[23] This involved requiring physicians to document their usual medication histories on a specially designed form instead of on the history and physical (Online Appendix). An educational campaign was in progress, including information about medication reconciliation and case presentations of local adverse events resulting from admission medication errors. The physicians did not receive any training on taking medication histories or on compiling a best possible medication history. We had not yet formally implemented a second step, such as a verification of the history or comparison to the admission medication orders. Because of accreditation requirements and ethical considerations, we could not suspend the medication reconciliation implementation for the purposes of the study; thus, it was performed in parallel with the natural process of patient care. At the time of the study, the form was not yet being used consistently by physicians (continuous weekly audits revealed 30% to 60% compliance).

Subjects

Subjects were patients admitted to the general pediatric unit from the emergency department during a 10-week period in 2007. Patients discharged before 24 hours were excluded because medication reconciliation is generally required to be performed within 24 to 48 hours of admission. A senior pharmacy student with training in pediatric clinical pharmacy (hereafter referred to as the study pharmacist) identified all admissions to general pediatrics during the study period. To approach every patient within 24 hours of admission, the study pharmacist worked flexible shifts throughout the week, including weekends. Subjects were identified by daily electronic patient rosters and direct communication with medical teams to identify admitted patients not yet physically on the ward. The population served by this hospital is among the most ethnically and linguistically diverse in the world, but no patient was excluded on the basis of lack of English proficiency because telephone interpreters were readily available. The study was approved by the Research Ethics Board at the Hospital for Sick Children.

Data Collection

After obtaining consent, the study pharmacist generated a best possible medication history including all prescription and over-the-counter medications. Patient characteristics including reason for admission, chronic conditions, and characteristics of the home medication regimen were recorded. These included the presence of "potentially highly toxic medications," a designation based both on internal incident reports and those defined by expert organizations,[10,12] and whether the patient was receiving 4 or more prescription home medications, a cutoff commonly used as a screening tool for medication reconciliation.[4] Whether the physician opted to use the medication reconciliation form was recorded.

After obtaining the best possible medication history, the pharmacist essentially performed medication reconciliation by comparing the best possible medication history to the admission medication orders. Any discrepancies between the 2 were coded as intentional but undocumented if the physician intended to change or discontinue the medication at admission but did not document this intent, or unintentional if the orders deviated from the home medication regimen in an unintended way. For example, if the medication was missing from the primary history or if it was documented correctly but mistakenly left off the orders, these would be unintentional discrepancies. This classification was based on direct communication between