

Medication Errors and Adverse Drug Events in Pediatric Inpatients

Original Contribution

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Rainu Kaushal; David W. Bates; Christopher Landrigan; Kathryn J. McKenna; Margaret D. Clapp; Frank Federico; Donald A. Goldmann

FROM ABSTRACT:

Context

Iatrogenic injuries, including medication errors, are an important problem in all hospitalized populations. However, few epidemiological data are available regarding medication errors in the pediatric inpatient setting.

Objectives

To assess the rates of medication errors, adverse drug events (ADEs), and potential ADEs; to compare pediatric rates with previously reported adult rates; to analyze the major types of errors.

Design, Setting, and Patients

Prospective cohort study of 1,120 patients at to 2 academic institutions.

Main Outcome Measures

Medication errors, potential ADEs, and ADEs were identified by clinical staff reports and review of medication order sheets, medication administration records, and patient charts.

Results

We reviewed 10,778 medication orders and found 616 medication errors (5.7%), 115 potential ADEs (1.1%), and 26 ADEs (0.24%).

While the preventable ADE rate was similar to that of a previous adult hospital study, the potential ADE rate was 3 times higher. The rate of potential ADEs was significantly higher in neonates in the neonatal intensive care unit (NICU).

Most potential ADEs occurred at the stage of drug ordering (79%) and involved incorrect dosing (34%), anti-infective drugs (28%), and intravenous medications (54%).

Conclusions

Medication errors are common in pediatric inpatient settings, and further efforts are needed to reduce them.

THESE AUTHORS ALSO NOTE:

"Iatrogenic injuries occur frequently in hospitalized patients and often have serious sequelae."

The Harvard Medical Practice Study estimated that 3.7% of hospitalized patients experienced an adverse event related to medical therapy, and of these iatrogenic injuries, 69% were preventable.

(Brennan TA, Leape LL, Laird N, et al. Incidence of adverse events and negligence in hospitalized patients: results from the Harvard Medical Practice Study I. *N Engl J Med.* 1991;324:370-376)

A more recent study reached similar estimates. (Thomas EJ, Studdert DM, Burstin HR, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. *Med Care.* 2000;38:261-271)

"An Institute of Medicine report in 1999 estimated that 44,000 to 98,000 people die each year at least in part because of medical error."

In the Harvard Medical Practice Study, the most common adverse events were complications of medication use (19.4% of all events), and 30% of patients with drug-related injuries died or were disabled for more than 6 months.

Studies have shown that adverse drug events (ADEs) in hospitalized adults were common, occurring at a rate of 6.5 per 100 adult admissions, costly, and often had severe sequelae.

Studies suggest that medication errors are common, occurring at a rate of 5 per 100 medication orders.

Less information is available regarding the epidemiology and prevention of medication errors and ADEs in pediatric inpatient settings.

Children pose unique challenges to the system for ordering, dispensing, administering, and monitoring medications because:

- (1) Weight-based drug dosing is needed for virtually all drugs in pediatrics, which involves more calculations than for adults.
- (2) Dispensing drugs in pediatrics is error-prone because pharmacists must dilute stock solutions.

(3) Young children do not have the communication skills to warn clinicians about mistakes and adverse effects from medications.

(4) All children, especially neonates, have more limited internal reserves than adults with which to buffer errors.

In this study, medication errors were defined as errors in drug ordering, transcribing, dispensing, administering, or monitoring.

RESULTS

The 36-day study period included 1120 admissions and 3932 patient-days, during which 10,778 orders were written.

[This is incredible:

10,778 perscription orders were given to 1,120 hospital admissions.

Or, 9.62 perscription orders per patient.

Also, 10,778 perscriptions orders were given for 3,932 patient-days.

Or, each patient averaged 2.74 perscription orders per day.]

“The rate of potential ADEs was considerably higher in neonates than in other age groups.”

Most medication errors were dosing errors, followed by route of administration errors.

Similarly, most potential ADEs were due to dosing errors, followed by frequency and route errors.

“The most common stage for medication errors and potential ADEs was physician ordering (74% and 79%, respectively), followed by transcription and nurse administration.”

“The most common drugs involved in medication errors and potential ADEs were anti-infective agents, analgesics and sedatives, electrolytes and fluids, and bronchodilators.”

COMMENT

“We found that medication errors were common in the inpatient pediatric setting.”

“Potential ADEs occurred more frequently in neonates.”

“Errors occurred most commonly at the stage of drug ordering.”

“Dosing errors and errors involving the intravenous route were most frequent.”

“The drug classes associated most frequently with errors were anti-infectives, electrolytes and fluids, and analgesics and sedatives.”

The authors compared the results of this study to a 1992 study using similar methods in an adult patient population, and “the rate of potential ADEs was about 3 times higher in this pediatric study.”

“As expected, we found that the errors with potential for harm occurred most often in the youngest, most vulnerable patients cared for.” (neonates)

“Neonatal weights change rapidly, making appropriate dosing particularly difficult.”

“Medication errors in critically ill neonates may have more serious consequences compared with relatively healthy neonates or older children because they have limited ability to buffer errors.”

“Pharmacists also face special challenges with neonatal drugs because medications generally are not supplied in dosages suitable for neonates and must be diluted.”

These authors also note:

- (1) They probably failed to detect some errors, particularly administration errors.
- (2) They did not attempt to detect inappropriate drug choice, so such errors are not reflected in the numbers.
- (3) The incidence of errors could have been reduced as the study progressed because the authors were obliged to take corrective action when errors were identified.

“The development and testing of medication error reduction interventions is important in pediatrics, especially in the NICU, given the increased medical vulnerability and decreased communication ability of small and critically ill children, the need for weight-based dosing, and the need for pharmacy dilution of stock medications.”