

AMERICAN ACADEMY OF PEDIATRICS

Committee on Drugs and Committee on Hospital Care

Prevention of Medication Errors* in the Pediatric Inpatient Setting

ABSTRACT. Medication errors that occur on a pediatric medical/surgical inpatient care unit are usually avoidable. Several steps are recommended to reduce these errors, beginning with the physician and including every member of the health care team. Pediatricians should help hospitals develop effective programs for safely providing treatment with medications to hospitalized children.

Hospitalized infants and children are subject to the advantages and the risks of inpatient care. Included in most medical and surgical treatment of pediatric patients in the hospital is the administration of medications that may be associated with undesirable effects in addition to the therapeutic effects. Adverse reactions to medications include those that are usually unpredictable, such as idiosyncratic or allergic responses, and those that are predictable and thus potentially avoidable, such as side effects or toxic reactions that are related to the inherent pharmacologic properties of the drug. In general, the number and severity of adverse medication reactions are directly related to the number of drugs administered to hospitalized patients.¹⁻³

In contrast to adverse drug reactions, medication errors (as defined in the footnote that appears in the bottom left corner of this page) occur as a result of human mistakes or system flaws. Providing drug treatment in the hospital setting usually requires a series of actions performed by several individuals—the physician, the unit clerk, the hospital pharmacist, and the nurse. Errors are possible at any step of the process from medication selection and ordering, order transcription, drug formulation, and drug dispensing to drug administration. The reported incidence of errors in treatment with medications ranges from 4% to 17% of all hospital admissions.^{1,2,4} An error occurs once in every 20 orders for medications.¹ Antibiotics, analgesics, and cardiovascular drugs are most frequently associated with errors, but no single medication accounts for more than 9% of the total.^{1,2,4} The most commonly reported errors include the fol-

lowing: inappropriate medication for the condition being treated; incorrect dosage or frequency of administration of medication; wrong route of administration; failure to recognize drug interactions; lack of monitoring for drug side effects; and inadequate communication between the physician, other members of the health care team, and the patient. Of these, incorrect dosing is the most frequent.^{5,6} In teaching hospitals, prescribing errors decrease with each year of training; the error rate for attending physicians, however, is exceeded only by that of first-year residents.⁴ Fortunately, 75% of erroneous medication orders are intercepted and corrected before the drugs are administered to patients.¹

Medication errors produce a variety of problems, ranging from minor discomfort to substantial morbidity that may prolong hospitalization or lead to death.^{1,3,7} Drug errors associated with morbidity and mortality increase health care costs by an estimated \$1900 per patient⁸ and are frequent causes of litigation involving patients, families, institutions, and physicians. In a study of medical liability suits filed during a 7-year period, the Physician Insurers Association of America found in more than 90 000 malpractice claims that medication error was the second most frequent cause and second most expensive basis for litigation.⁸ Pediatrics ranked sixth among 16 medical specialties in frequency of medication-related claims. With an average of \$292 136 per case, pediatric settlements were twice those of other specialties.

The American Academy of Pediatrics is committed to reducing medication errors in the treatment of children.⁹ Because the causes of drug errors are multifactorial, institutions caring for children must develop multidisciplinary programs involving active participation by physicians, nurses, pharmacists, and when feasible, information system specialists to significantly reduce medication errors. Such programs should be an integral part of the institutional quality assurance and quality performance activities and, when possible, incorporate computer-assisted drug ordering and monitoring. The Academy recognizes and supports the extensive studies and policies developed by other organizations to reduce/eliminate drug administration errors.^{10,11} The program delineated by the American Society of Health-System Pharmacists is one example of a comprehensive approach to the reduction of medication errors in hospitalized patients.¹⁰ Several of their recommendations are indicated in the Appendix.

Physicians who care for children in the hospital setting are encouraged to promote, if not actively

*Medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use. *United States Pharmacopoeia. The Standard.* November/December 1995:10.

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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develop, programs to reduce medication errors in their institutions. At the same time, it is incumbent on hospitals to include such programs in their rules and regulations in an effort to reduce the risk of hospitalization and the attendant errors associated with drug treatment.

APPENDIX

The following tables outline some of the recommendations developed by various individuals and groups to assist in reduction of drug errors^{6,9,10}:

Hospital-wide Actions and Policies to Decrease Medication Errors

- Establish and maintain functional formulary system with policies for drug evaluation, selection, and therapeutic use.
- Provide an adequate number of well-trained persons to prepare, dispense, and administer medications.
- Provide a suitable work environment for safe, effective drug preparation.
- Establish a clearly defined system for drug ordering, dispensing, and administration that includes review of the original drug order before dispensing and administration.
- Provide ongoing formal quality improvement of the therapeutic use of medications including a drug-use evaluation (DUE) program.
- Maintain medication profiles for both inpatients and ambulatory patients receiving care at the hospital.
- Computerize systems, where possible, to check dose and dosage schedules, drug interactions, allergies, and duplicated therapies.

Medication Ordering to Reduce Errors

Physician prescriptions and drug orders are a means of communicating, so they must be legible, clear, and unambiguous. The following steps may help to ensure that medication orders communicate safely and effectively.

- Confirm that the patient's weight is correct for weight-based dosages.
- Identify drug allergies in patients.
- Write out instructions rather than using abbreviations.
- Avoid vague instructions (eg, take as directed; no order should be written without dose and volume where appropriate).
- Specify exact dosage strength.
- Avoid use of a terminal zero to the right of the decimal point (eg, use 5 rather than 5.0) to minimize 10-fold dosing errors.
- Use a zero to the left of a dose less than 1 (eg, use 0.1 rather than .1) to avoid 10-fold dosing errors.
- Avoid abbreviations of drug names (eg, MS may mean morphine sulfate or magnesium sulfate).
- Spell out dosage units rather than using abbreviations (eg, milligram or microgram rather than mg or μg ; units rather than u).
- Ensure that prescriptions and signatures are legible, even if it means printing the prescriber's name that corresponds to the signature.

Prescriber Actions to Decrease Medication Errors

- Stay current concerning appropriate treatment of medical conditions they manage.
- Review the patient's existing drug therapy before prescribing new medications.
- Remain familiar with individual hospital medication ordering systems.
- Ensure that drug orders are complete, clear, unambiguous, and legible.
- Reserve verbal orders for instances when it is impossible or impractical to write an order or enter it in the computer.
- When possible, speak with the patient or caregiver about the medication that is prescribed and any special precautions or observations that should be noted, such as allergic or hypersensitivity reactions.
- Clarify orders to "hold" medications and avoid these whenever possible.

Pharmacy Actions to Decrease Medication Errors

- Remain available to prescribers and nurses to participate in drug therapy development and monitoring.
- Never guess or assume the intent of confusing medication orders.
- Review an original copy of the written medication order before dispensing a medication, except in emergency situations.
- Prepare drugs in a clean and orderly work area with a minimum of interruptions.
- Dispense medication in a timely fashion using a unit-dose, ready-to-administer form whenever possible.
- Provide counsel to patients or caregivers about their medications.

Nurse Actions to Decrease Medication Errors

- Be familiar with medication ordering and use system.
- Verify drug orders before medication administration.
- Confirm patient identity before administration of each dose.
- Check medication calculations with a second individual.
- Unusually large volumes or dosage units for a single patient dose should be verified.
- When a patient questions whether a drug should be administered, the nurse should listen, answer questions, and if appropriate, double check the medication order.
- Remain familiar with the operation of medication administration devices and the potential for errors with such devices.

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