MAYO CLINIC

SPECIAL ARTICLE

Medication Errors: An Overview for Clinicians

Christopher M. Wittich, MD, PharmD; Christopher M. Burkle, MD, JD; and William L. Lanier, MD

Abstract

Medication error is an important cause of patient morbidity and mortality, yet it can be a confusing and underappreciated concept. This article provides a review for practicing physicians that focuses on medication error (1) terminology and definitions, (2) incidence, (3) risk factors, (4) avoidance strategies, and (5) disclosure and legal consequences. A medication error is any error that occurs at any point in the medication use process. It has been estimated by the Institute of Medicine that medication errors cause 1 of 131 outpatient and 1 of 854 inpatient deaths. Medication factors (eg, similar sounding names, low therapeutic index), patient factors (eg, poor renal or hepatic function, impaired cognition, polypharmacy), and health care professional factors (eg, use of abbreviations in prescriptions and other communications, cognitive biases) can precipitate medication errors. Consequences faced by physicians after medication errors can include loss of patient trust, civil actions, criminal charges, and medical board discipline. Methods to prevent medication errors from occurring (eg, use of information technology, better drug labeling, and medication reconciliation) have been used with varying success. When an error is discovered, patients expect disclosure that is timely, given in person, and accompanied with an apology and communication of efforts to prevent future errors. Learning more about medication errors may enhance health care professionals' ability to provide safe care to their patients.

 ■ Mayo Clin Proc. 2014;■■(■):1-10

From the Department of Internal Medicine, Division of General Internal Medicine (C.M.W.) and Department of Anesthesiology (C.M.B., W.L.L.), Mayo Clinic, Rochester, MN.

Since the publication of the landmark Institute of Medicine (IOM) report *To Err is Human*,[1] there has been an enhanced focus on improving the safety of health care. Medication errors are one remediable portion of the safety continuum.

Medication use in the United States is highly prevalent. In a large national survey, 81% of people took a medication in the preceding week, and 50% took at least 1 prescription medication.[2] The complexity of modern pharmacotherapy lends itself to confusion by patients and errors by health care professionals. In a survey of hospitalized patients, only 27.9% could list their discharge medications, and even fewer could state the intended use of their medications.[3] Additionally, studies have reported hospital inpatient medication error rates of 4.8%[4] to 5.3%[5] and a relationship between medication errors and adverse events.[5] Importantly, both physicians and patients are reported to underestimate the number of deaths due to preventable errors of any type,[6] including deaths related to medications.

Medication errors are an important clinical issue. However, even at the most fundamental level, the definitions associated with these errors can be confusing, and the impact on individuals and society can be underappreciated. This article provides an overview of medication errors for practicing physicians and focuses on medication error (1) terminology and definitions, (2) incidence, (3) risk factors, (4) avoidance strategies, and (5) disclosure and legal consequences.

MEDICATION ERROR TERMS AND DEFINITIONS

Medication error terminology can be confusing because of overlapping definitions.[7] In health care, an *error* has been defined by the IOM as "the failure of a planned action to be completed as intended (error of execution) or the use of a wrong plan to achieve an aim (error of planning). An error may be an act of commission or an act of omission."[8] A *medication error* has been defined by Bates et al[5] as "any error occurring in the medication use process" and focuses on problems with the delivery of a medication to a patient. Importantly, although some medication errors cause harm to the patient, most do not (eg, "near misses").[9] In fact, one study of the frequency of medication errors discovered that

fewer than 1% of medication errors resulted in an adverse drug event.[5] Examples of medication errors could include giving a medication to the wrong patient, giving the wrong dose of a medication, not prescribing a medication that was indicated, entering an order for the wrong patient, or forgetting to give a medication that was due.

Drug safety (also known as *pharmacovigilance*) focuses on the safety and regulation of the drug itself. Drug safety is defined by the World Health Organization as the "science and activities relating to the detection, assessment, understanding, and prevention of adverse effects or any other medicine-related problem."[10] An *adverse drug event* is "an adverse outcome that can be attributed, with some degree of probability, to an action of a drug."[7] An adverse drug event may or may not be due to a medication error. For example, if a patient is given an antibiotic for the first time and a rash develops, it is an adverse drug event that was not caused by a medication error.[5] In contrast, if the patient is already known to be allergic to an antibiotic and is still given that drug, the rash that develops is an adverse drug event due to a medication error.[5]

Adverse drug effect and reaction can be defined as "an appreciably harmful or unpleasant reaction, resulting from an intervention related to the use of a medicinal product, which predicts hazard from future administration and warrants prevention or specific treatment, or alteration of the dosage regimen, or withdrawal of the product."[7,11] More simply stated, adverse drug effects and reactions are nonpreventable adverse drug events.[7,11] However, with repeated administration of the drug, the adverse drug event becomes preventable. An *adverse drug effect* and *adverse drug reaction* are equivalent terms except that an effect is from the perspective of the drug and a reaction is from the perspective of the patient.[7,11] However, when assigning causality, clinical judgment must be used to determine if the effect or reaction is biologically plausible on the basis of what is known about the pharmacologic features of the medication.

Categories of medication errors have been developed in an attempt to standardize communication and reporting. These categories use different approaches to define the relationship between the types of errors and the types of harm.

The American Society of Health-System Pharmacists developed a system for categorizing medication errors based on prescribing, omission (ordered drug not administered), timing, use of an unauthorized drug (not authorized by a legitimate prescriber), improper dosing, wrong dosage form, wrong drug preparation, wrong administration technique, deteriorated drug (an expired medication), monitoring (failure to use laboratory data to monitor toxicity or effect), compliance, and other errors.[12] The American Society of Health-System Pharmcists has identified common causes leading to these errors, including drug product nomenclature, illegible handwriting, labeling errors, excessive workload (among physicians, nurses, or pharmacists), and medication availability (manufacturer shortages of medications).[12]

Medication errors may also be categorized as errors in planning and errors in executing that plan.[13] In practice, a comprehensive system that evaluates the harm, root cause, and psychological aspects of errors is beneficial to optimize communication and help prevent future errors.

When categorizing errors, it is also beneficial to account for the consequences of those errors, including patient harm. The National Coordinating Council for Medication Error Reporting and Prevention categorizes the relationship between error and harm as (1) no error (circumstances have the capacity to cause error), (2) error but no harm, (3) error and harm, and (4) error and patient death.[14] They further divide these 4 categories into a continuum that considers the need for monitoring, medical or surgical treatment, or life-sustaining therapy.[14]

INCIDENCE OF AND HARM FROM MEDICATION ERRORS

The IOM's *To Err is Human* estimated, on the basis of an older study, that medication errors cause 1 of 131 outpatient and 1 of 854 inpatient deaths.[1] The IOM later summarized the literature on medication error incidence rates in their 2007 report *Preventing Medication Errors*.[9] Individual studies have reported inpatient medication error rates of 4.8%[4] to 5.3%.[5] In another study, prescribing errors for inpatients occurred 12.3 times per 1000 patient admissions.[15]

Error rates are influenced by numerous factors, a few of which include the health care setting, route of drug administration, and

Mayo Clin Proc. ■ XXX 2014;■■(■):1-10 ■ http://dx.doi.org/10.1016/j.mayocp.2014.05.007
www.mayoclinicproceedings.org