Invited Editorial

Medication Errors: What Is Their Impact?

David W. Bates, MD, MSc1,3
Sarah P. Slight, MPharm, PhD, PGDip1,4

Author affiliations:
1 Department of Medicine, Brigham and Women’s Hospital, Boston, MA, USA;
2 Harvard Medical School, 250 Longwood Ave, Boston, MA, USA;
3 Department of Health Policy and Management, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA, USA;
4 Division of Pharmacy, School of Medicine, Pharmacy and Health, Durham University, UK.

Corresponding author:
David W. Bates, MD, MSc
The Center for Patient Safety Research and Practice,
Division of General Internal Medicine,
Brigham and Women’s Hospital,
Boston, MA, USA
Tel: +1 617 732 5650
Fax: +1 617 732 7072
E-mail: dbates@partners.org

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The loss of a loved one can be devastating. The knowledge that their death could have been prevented makes it harder still. Medication errors can result in severe patient injury or death, and are preventable. While most are minor, there is a huge spectrum—and some are fatal. On the 4th of January 2001, Wayne Jowett was injected with a dose of the cytotoxic drug vincristine intrathecally rather than intravenously, a mistake that should never occur. He suffered leg paralysis and respiratory failure, and was transferred to an intensive care unit, and after he failed to recover his ventilator was switched off a month later. At the inquest into the 18 year old’s death, the coroner was told that 14 other patients had died or been left paralyzed as a result of the same mistake in the previous 15 years. Had specific prevention strategies been in place, with examples being bar-coding or a forcing function that didn’t allow vincristine to be injected through an intrathecal catheter, this would not have occurred. Fortunately, most medication errors are not this catastrophic. But how big a problem are they, and how can they best be prevented?

In this issue of the Mayo Clinic Proceedings, two articles address this domain---Wittich et al.(2) discuss some of the questions providers may have about medication errors, reviewing some of the evidence about them, while Mixon et al.(3) present a study of the frequency of medication errors after discharge, clearly a vulnerable time.

As Wittich et al note, medication errors are common, and their type and frequency vary substantially by setting—they are much more frequent in intensive care units, for example, where patients receive an average of 25 medications a day(4) and much less of a problem in obstetrics where medications are generally avoided. When they result in harm, this is called an adverse drug event (ADE)—ADEs associated with a medication error are preventable. Previous studies of hospitalized patients have reported medication error rates of 4.8% and 5.3%,(5, 6). These errors can occur at any stage of the medication use process—ordering, dispensing, administering and monitoring. Although
most medication errors do not result in patient injury, those that do are more likely to occur at the prescribing (56%) and administration (34%) stages in the hospital setting, and be intercepted at the former stage (48%) than the latter (0%)—with respect to administration errors, there is no one between the nurse and the patient.(7)

While many more studies have been done of hospitalized patients than in the outpatient setting, it is clear that medication errors are a problem in both, and many more medications are consumed outside the hospital than in it. In one study, Gurwitz et al. assessed the incidence and preventability of ADEs in older patients in the ambulatory setting,(8) and found that most errors occurred at the prescribing (n=246, 58.4%) and monitoring stages (n=256, 60.8%). Prescribing stage errors included ‘wrong drug/wrong therapeutic choice’ (n=114, 27.1%) and ‘wrong dose’ (n=101, 24.0%), whereas the two most common errors that occurred at the monitoring stage were ‘failure to act on available information relating to laboratory results’ (n=154, 36.6%) and ‘inadequate laboratory monitoring of drug therapies’ (n=152, 36.1%). Many preventable ADEs were related to errors in patient adherence (n=89, 21.1%), and included ‘continuing to take a medication despite recognized adverse effects or drug interactions known to the patient’, and ‘taking another person’s medication’. In contrast to the hospital setting, responsibilities for medication administration and monitoring are usually extended to the patient and/or family member in the ambulatory care setting, so that there are many more degrees of freedom in this setting.

Just after a hospital discharge is another very vulnerable time—in a study of medical patients discharge from hospital, Forster et al found that 19% of patients had adverse events in the immediate post-discharge period, and 6% suffered a serious adverse drug event.(9) The Mixon paper examines this area in more detail, and assessed the frequency of medication errors, and the association of patient- and medication-related factors with post-discharge medication errors, with a particular focus on patient
literacy and numeracy. This study was done in patients with cardiovascular disorders, and this group often has many medications changed during admissions, especially after an incident event. The authors compared the pre-admission medication list of patients recently hospitalized for cardiovascular disease with their discharge medication list, and classified discordant medication as either an error of omission (the patient was not taking a medication that was on their discharge list) or error of commission (the patient was taking a medication not listed on their discharge list). Over half of the hospitalized patients studied had at least one unintentional discrepancy between both lists, and there were more among patients with lower numeracy or health literacy. High levels of depression were also associated with high odds of errors of commission. Although this study did not assess clinical outcomes such as ADEs, other studies have found exposure of inpatients to antidepressant drugs (odds ratio [OR], 3.3) and cardiovascular drugs (OR, 2.4) independent correlates of preventable and severe ADEs, respectively. (10) In the ambulatory care setting, cardiovascular drugs were among the most frequently used prescription drug classes in our study population and the most frequently implicated agents in preventable ADEs (n=103, 24.5%). In contrast, antidepressants and sedative/hypnotics, which were used by more than 10% of the study population, were implicated in far fewer of the preventable ADEs (n=15, 3.6% and n=6, 1.4%; respectively). Thus, the prevalence of use of these medicines in the source population may reflect the frequency of ADEs in most, but not all, cases. Perhaps the most interesting findings from the Mixon paper were the explorations of literacy and numeracy. Lower numeracy was not associated with misunderstandings around dose or frequency, but with having a discordant medication and having a misunderstanding in indication. In general, health care systems could do better at understanding the health care literacy and numeracy of their patients, and implementing interventions tailored to the specific needs of their patients.
Healthcare provider factors can also lead to medication errors. We examined the underlying causes of prescribing and monitoring errors in primary care practices and found a number of healthcare provider factors may possibly have contributed to these errors. (11) These factors included prescribers’ therapeutic training, drug knowledge and experience, knowledge of the patient, and perception of risk. High workload, time pressures, and interruptions in the day-to-day activities of doctors and nurses are also known patient safety concerns, particularly around medication administration errors. Westbrook et al. observed interruptions occurring in more than 50% of nurses’ medication administrations; each interruption was associated with a 12.1% increase in procedural failures and a 12.7% increase in clinical errors. (12)

With respect to prevention, the most effective strategies will depend on the clinical setting. In hospitalized patients, implementation of computerized physician order entry linked with clinical decision support, has been the single most effective strategy by providing physicians with dosing suggestions, assisting them with calculations and monitoring, and checking for harmful drug-allergy, drug-drug and drug-disease interactions. (13-15) If appropriately implemented, CPOE systems can help improve the communication between healthcare professionals and patients. Shamliyan et al. found that the use of CPOE systems was associated with a 66% reduction in medication errors in adults (odds ratio [OR] = 0.34), with a similar effect found in children. (16) These CPOE systems also contributed to a statistically significant (P ≤ 0.05) reduction in the number of ADEs in five studies. (17) Bar-coding also has a large impact on inpatient medication safety. (18)

In the ambulatory setting, it is less clear which strategies will be most important for improving safety, though computerizing prescribing will undoubtedly be one of them. It is clear, though, that the immediate post-discharge period is particularly hazardous for preventable patient harm. One simple approach is to have pharmacists
call patients after discharge, which has decreased adverse drug event rates.(19) Other
tools to prevent post-discharge harm are still being developed and are not yet in routine
use in most organizations. One example is the Partners Post Discharge Medication
Reconciliation Tool,(20) which was designed to make it easier for primary care providers
to compare and contrast between pre-admission and post-discharge medication
regimens, by displaying identical medication next to each other and highlighting any
changes that were made. Primary care providers are presented with an active reminder
for all discharge patients whose medications have not been reconciled in full.
Approaches which are tailored to meet patients’ specific needs, including their issues
such as literacy, numeracy and elevated risk for specific issues, are likely to be helpful in
the future.

Medication safety is a key issue which causes substantial harm. Many prevention
strategies have already been developed, though these are more mature for the inpatient
setting than in outpatients. Providers need to understand how to leverage these
prevention approaches to make the medication-related care they deliver safer in each
setting—only if we take advantage of these lessons can we avoid repeating the mistakes
of the past, such as what happened to Wayne Jowett and those who preceded him.
References


