Medication Reconciliation

Transfer of medication information across settings—keeping it free from error.

By Jane H. Barnsteiner, PhD, RN, FAAN

Medication error is the most common type of error affecting patient safety,[1] occurring most often at points of transition in care—on admission to a hospital, at transfer from one department to another (such as from critical care to general care), and at discharge home or to another facility. The principal cause of medication error at such times is the incorrect or incomplete transfer of medication information.[2]

Not only is a patient's medication history not integrated throughout settings, there is no standardized location where such information is kept, and a health care provider may find herself obliged to retrieve it from the hospital admission database, the hospital medication administration record, the physician's patient history and progress notes, and the pharmacy notes or database. Without input from all those sources, information concerning a patient's medication allergies and the medications that he took previously may be incomplete or inaccurate.

Accurate medication data are necessary to monitor patient adherence and therapeutic response and to prevent drug–drug interactions and adverse effects. Preventable adverse drug events (ADEs) are associated with one of every five injuries or deaths occurring in the health care system.[3] Considerable evidence indicates the potential for preventable ADEs at transitional points of care[2]—an estimated 46% to 56% of all medication errors occur at such points.[1,4] The clinicians at the point of care at which these preventable ADEs occur usually are nurses, physicians, and pharmacists.

A "medication reconciliation process," one that focuses on specifying medications and maintaining a current, accurate list of those a patient has received at different points in care, has been shown to decrease the incidence of medication errors that occur during care at points of transition.[4-8] As part of that process, the accuracy of the list is validated and it is reviewed and amended, if necessary, at specified times.[6] A reconciliation record usually includes the name of the medication, dosage, frequency, and route of administration, as well as known allergies to medication.

Considerable evidence indicates the potential for preventable error at transitional points of care.

This article describes the scope of the problem of inaccuracy of medication lists and reviews innovations that improve the transfer of medication information within the hospital.

SEARCH STRATEGIES

There is little written about medication reconciliation in the health care literature and nothing written about it in the nursing literature. I reviewed English-language health care literature dating from 1965 through March 2004. Because the term "medication reconciliation" is of recent currency, it's likely that the specific term was not used in some older literature. In addition, bibliographies and the Web sites of patient safety organizations were searched. Search terms used for this report include "medication errors," "medication reconciliation," "medication safety," and "medication systems."

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Table 1. Studies of Medication Reconciliation

STUDY	AIM	SETTING
Miller LG, et al. ***Fam Pract Res J*** **1992; 12(4):421-9**	Improve family practice office chart documentation of prescribed medications through the use of duplicate prescription forms	Ambulatory family practice
Wagner MM, Hogan WR. ***J Am Med Inform Assoc*** **1996;3(3):234-44**	Assess the correspondence between the medication the patient is taking and the documentation in the EMR	Outpatient geriatric center
Bedell SE, et al. ***Arch Intern Med*** **2000;160(14):2129-34**	Examine the frequency of discrepancy between medications prescribed and those taken and the associated causal factors Compare medication containers and reported use of medication with medical records	5 cardiology, 3 internal medicine practices
Paquette-Lamontagne N, et al. ***Ann Pharmacother*** **2001;35(7-8):953-8**	Improve the accuracy of patient profile information in community pharmacies with the use of discharge prescription forms	Medical units at 3 teaching hospitals
Pronovost P, et al. ***J Crit Care*** **2003; 18(4):201-5**	Reduce medication errors with a reconciliation process using a paper form at discharge from surgical ICU	Adult surgical ICU
Pronovost P, et al. ***J Clin Outcomes Manage*** **2004;11(1):26-33**	Reduce medication errors with a reconciliation process using an electronic form at discharge from surgical ICU	Adult surgical ICU
Rozich J, et al. ***Jt Comm J Qual Saf*** **2004;30(1):5-14** **Rozich J, Resar R.** ***J Clin Outcomes Manage*** **2001;8(10):27-34**	Reduce medication discrepancies at health care transition points through the implementation of a medication reconciliation process on admission, during transfer, and at discharge from the hospital	Acute care inpatient
Whittington J, Cohen H. ***Qual Manage Health Care*** **2004;13(1):53-9**	Reduce the percentage of admission ADEs caused by errors in reconciliation through the use of an admission reconciliation form as hospital medication record and discharge prescription form	4 hospitals

EMR = electronic medical record

SAMPLE	RESULTS
Baseline chart review: 67 charts Duplicate prescription form: 1 week = 50 charts 40 months = 69 charts	Baseline: 51 patients (76%) had prescribed medications, but 87% of their charts had either incomplete or no documentation 1 week: 83% of charts had complete prescription medication documentation 40 months: 82% of charts had complete prescription medication documentation
117 patient records	Mean number of medications per patient: 5.67 Mean number of medications listed in the EMR: 4.69 Reasons for missing medication recording: • Misreport by patient: 36% • MD/NP failure to note medication changes in EMR: 26%
312 medical records	545 discrepancies among 239 patients (76%) • Patient taking medications not recorded in chart: 278 (51%) • Patient not taking recorded medication: 158 (29%) • Difference in dosage: 109 (20%) Significant predictors of discrepancy: patient age, number of medications, multiple physicians
55 patients in a control group, 34 in an experimental group in which the discharge prescription form was used	40% of medication profiles in control group were complete vs. 82% in experimental group
Baseline chart review: 33 ICU discharge charts Reconciliation process: 10–15 ICU discharge charts per week for 24 weeks	Baseline: 94% of discharge orders changed because of errors Week 24: discharge error rate reduced to 0
1,455 medication reconciliation forms in 1 year	21% of patients required medication order change 6% of changes were related to allergy discrepancy
Baseline: 20 charts per week for 6 weeks Subsequent: ongoing chart review	Baseline medication discrepancy rate: 213 per 100 admissions 7-month postreconciliation discrepancy rate: 42 per 100 admissions
Not reported	Change from 45% to almost 95% accuracy of medication list on implementation of reconciliation process

Nine studies that describe discrepancies in medication lists and reconciliation interventions were identified in the search (see Table 1, page 32), all of them related to institutional quality-improvement efforts. Given the early stage of research conducted on the topic, the studies were not graded according to either the Cochrane Review or Agency for Healthcare Research and Quality (AHRQ) rating scales.

All of the articles reviewed concerned descriptive studies, for the most part quality-improvement projects using a small convenience sample of patient charts rather than a random selection of subjects or medical records. The authors provided little information on the testing of interventions for validity and reliability. Nonetheless, the studies provide a picture of the state of discontinuity existing, generally, in medication practices at transitional points.

The only information collected in these studies relates to prescribed medications; none of them reviewed either over-the-counter or alternative medications, and the incidence of incomplete or inaccurate documentation therefore may be even greater than is indicated.

THE SCOPE OF THE PROBLEM

In the ambulatory setting, 50% to 75% of visits result in a prescription for medication, and Miller and colleagues have reported that 87% of patient charts in one such setting were incompletely documented, in regard to medication.[9] Incomplete documentation of prescribed medications in the patient's chart obliges the prescriber to rely on his memory and creates the possibility of error when refills of the prescription are written or another clinician sees the patient.

Bedell and colleagues reported a 76% discrepancy rate in a study of five cardiology and three internal medicine practices.[10] Discrepancies were classified in three categories, the most common type (51%) being the taking of medications not recorded in the patient's chart. Twenty-nine percent of discrepancies were attributable to the patient not taking the recorded medication, and the remaining 20% to the wrong dosage taken. The patient's age, the number of medications prescribed, and care provided to the patient by more than one physician were significant predictors of a medication discrepancy.

Recently, Rozich and colleagues reported an 85% rate of nonexistent or inaccurate lists of medications currently being taken in an inpatient population.[6] Because of inaccurate medication lists, clinicians spend a great deal of time trying to identify which medications a patient is supposed to be taking. The researchers reported that nursing staff members at their institution spent, on average, an hour per day reconciling medications for patients either recently admitted or transferred.[6]

When nurses identified discrepancies, physicians changed the discharge orders of 94% of the patients.

The omission of medications attributable to incomplete orders usually is not recorded in error-reporting systems. When a clinician realizes that a medication a patient had been taking has not been ordered—postoperatively, for example—she simply asks the physician to order it; such an omission is not generally viewed as an error and is not always reported.

Pronovost and colleagues collected information on whether the medications listed in the ICU discharge orders were the ones that the patient currently was receiving and whether allergies were listed correctly with the orders.[5] If any discrepancy was noted, the nurse asked the physician whether he wanted to make changes. When nurses identified discrepancies, physicians changed the discharge orders of 94% of the patients.

The unwieldiness of the paper chart presents a considerable obstacle in the development and maintenance of a complete and accurate listing of medications, and the electronic medical record (EMR) has been touted as a way of streamlining the process. But Wagner and Hogan examined the correspondence between medications that patients were taking and the ones that were recorded in the EMR at an outpatient geriatric center and found numerous errors in the medication records.[11] Patients were taking a mean of 5.67 medications, but the EMR listed a mean of 4.69—approximately one medication missing from the record per patient. Although 36% of the omissions were attributable to misreporting by the patient, 26% were attributable to failure of the clinician to

capture changes of medication in the EMR. Data entry errors accounted for 28% of the discrepancies.

EFFECTIVE STRATEGIES

A variety of strategies have been shown to be useful in the medication reconciliation process, incorporating steps that can be taken in both inpatient and outpatient settings.

For the inpatient setting, Rozich and Resar describe a process in which the admitting nurse implemented a protocol to verify every drug a patient was taking upon admission.[2] A team at Luther Midelfort Hospital in Eau Claire, Wisconsin, designed a medication reconciliation form that included dosage, frequency, and the time at which each medication was taken last. If the patient was uncertain, pharmacy records were consulted and office records retrieved. All medications were listed on the medication form, which was kept at the front of the patient's chart. On the form, information often located in several areas of the health record was collected, organized, and made readily accessible. A comparable reconciliation process took place when the patient was transferred to another unit and again at discharge from the hospital, at which point a pharmacy computer generated a record of every medication the patient received while there. The physician then checked the medications to be continued, and a duplicate of the checklist served as a prescription form. The system reduced discrepancies from 213 to 42 per 100 admissions.[6] The medication reconciliation review tool may be found at the Institute for Healthcare Improvement Web site at www.ihi.org.

Pronovost and colleagues implemented a similar medication reconciliation process to be used upon discharge from the ICU,[4] entailing the reconciliation of prehospital, ICU-admission, and ICU-discharge medications. Before implementation of that process, 94% of ICU discharge medication orders needed changing, and 24 weeks afterward, none did.

Systems are necessary to communicate to primary care providers the medication changes made in the course of hospital stays, during which 53% of the drugs prescribed were changed in a study conducted by Himmel and colleagues. Primary care providers want to be informed of patient discharge medication regimens,[12] and providing the patient with a data form listing all discharge medications will assist in the transfer of information to the primary care physician and the patient's pharmacist.

Whittington and Cohen have described a medication reconciliation process that used a reconciliation form on admission, throughout the hospital stay, and at discharge,[8] at which point the physician checked whether a medication was to be continued or discontinued. The form served both as a hospital medication record and a discharge prescription form to be sent to the pharmacy. Medication accuracy improved from 45% at baseline to almost 95% with the use of the process.

Paquette-Lamontagne and colleagues used a similar integrated discharge form in a study involving control and experimental groups. The accuracy of discharge medication prescriptions in the control group was 40%, whereas in the experimental group, which used an integrated discharge medication list on a single form, it was 82%.[7]

Using a paper documentation system in the ambulatory care setting, Miller and colleagues demonstrated that a duplicate prescription form improved chart documentation,[9] with one part of the form serving as the prescription and the other being placed in the chart. Complete documentation of prescribed medications had increased from 13% to 83% one week after implementation and remained at that level (82%) three and a half years afterward.

Patients can serve as their own advocates in the medication reconciliation process and should be encouraged to bring all medications, including over-the-counter and alternative remedies such as herbal preparations, to every health care visit. Such a practice will ensure accuracy and facilitate the identification of any change in medications made by either the patient or another clinician. In the brochure entitled *20 Tips to Help Prevent Medical Errors* (2000), the AHRQ encourages consumers to follow that practice, "brown-bagging" all medications and dietary supplements to help keep their providers' records current.[13]

Internet Resources

- Agency for Healthcare Research and Quality. *Patient fact sheet. 20 tips to prevent medical errors.* 2000 www.ahrq.gov/consumer/20tips.htm
- Midelfort L. *Medication reconciliation review.* www.ihi.org/IHI/Topics/PatientSafety/MedicationSystems/Tools/Medication+Reconcilition+Review.htm

CHALLENGES IN MEDICATION RECONCILIATION

Nurses can take the lead in designing and implementing systems to record medications and changes in them so that a systematic record is readily available to all providers. The need for medication reconciliation processes should be emphasized in patient safety programs. Nurses and all other members of the health care team should be aware that at points of transfer there is susceptibility to the incidence of medication error, and that systems are necessary to ensure the provision of safe care.

It is noteworthy that the Joint Commission on Accreditation of Healthcare Organizations has instituted a medication reconciliation process requirement for the 2005 National Patient Safety Goals. Implementation of the requirement will be challenging, given the magnitude of the issue and the few demonstrably successful programs addressing it.

The paucity of literature on the topic is indicative of the need for further research—systematic, multisite intervention studies are necessary to accurately assess the scope of the problem and to test interventions to decrease the potential for the incidence of ADEs. Research is necessary also to determine whether lists of medications are more accurate with the paper record or with the EMR.

Nothing in the literature indicates which patients will benefit most from a formal, systematic medication reconciliation process. Will it be all those admitted to an acute care setting, or can the process be applied to only patients taking more than one medication or to those with diagnoses associated with more than one medication? In which patient care areas should medication reconciliation be maintained as standard practice? The literature indicates that the ICU is a setting that is susceptible to medication error. Are there others, such as the ED? Research into the matter is needed.

Medication reconciliation systems take time both to design and implement. Initially, medication reconciliation may take an additional 30 to 60 minutes of nursing or pharmacy time on each admission.[2] The simplification of the collection tool therefore is essential. Pronovost and colleagues reported that once systems were refined, a paper reconciliation intervention took 20 minutes on admission to the ICU and 20 minutes at discharge from it, and that electronic systems take less time.[5]

The difficulties encountered in obtaining a list of prehospital medications are discussed in nearly all of the literature. With the increasing implementation of the integrated EMR, access to data throughout the continuum of care should be less of a challenge.

There is compelling evidence of the benefit conferred by the design and implementation of a medication reconciliation process, to be used at transition points in the health care delivery system. More research, using rigorous methods, is necessary for the clear understanding of the discontinuity, inaccuracy, and incompleteness in medication documentation, and for the development of effective, streamlined methods of medication reconciliation. ▼

REFERENCES

1. Bates DW, et al. The costs of adverse drug events in hospitalized patients. Adverse Drug Events Prevention Study Group. *JAMA* 1997;277(4):307-11.
2. Rozich J, Resar R. Medication safety: one organization's approach to the challenge. *Clin Outcomes Manage* 2001; 8(10):27-34.
3. Leape LL, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study II. *N Engl J Med* 1991;324(6):377-84.
4. Pronovost P, et al. Medication reconciliation: a practical tool to reduce the risk of medication errors. *J Crit Care* 2003;18(4):201-5.
5. Pronovost P, et al. A practical tool to reduce medication errors during patient transfer from an intensive care unit. *J Clin Outcomes Manage* 2004;11(1):26-33.
6. Rozich J, et al. Patient safety standardization as a mechanism to improve safety in health care. *Comm Qual Saf.* 2004; 30(1):5-14.
7. Paquette-Lamontagne N, et al. Evaluation of a new integrated discharge prescription form. *Ann Pharmacother* 2001;35(7-8):953-8.
8. Whittington J, Cohen H. OSF healthcare's journey in patient safety. *Qual Manage Health Care* 2004;13(1):53-9.
9. Miller LG, et al. Improving prescription documentation in the ambulatory setting. *Fam Pract Res J* 1992;12(4):421-9.
10. Bedell SE, et al. Discrepancies in the use of medications: their extent and predictors in an outpatient practice. *Arch Intern Med* 2000;160(14):2129-34.
11. Wagner MM, Hogan WR. The accuracy of medication data in an outpatient electronic medical record. *J Am Med Inform Assoc* 1996;3(3):234-44.
12. Himmel W, et al. What happens to long-term medication when general practice patients are referred to hospital? *Eur J Clin Pharmacol* 1996;50(4):253-7.
13. Agency for Healthcare Research and Quality. *Patient fact sheet: 20 tips to prevent medical errors.* 2000. http://www.ahrq.gov/consumer/20tips.htm.