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USP Patient Safety
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USP Patient Safety CAPSLink™

This message has been sent to you as a service of the U.S. Pharmacopeia, Center for the Advancement of Patient Safety (CAPS). USP is a not-for-profit, non-governmental organization that promotes the public health by establishing state-of-the-art standards to ensure the quality of medicines and other health care technologies. CAPS is a component of USP's Patient Safety public health program. The USP Center for the Advancement of Patient Safety was created to encourage medication error reporting, conduct data analysis and research, develop educational programs, and propose standards, recommendations, and guidelines that ultimately improve the safety and quality of patient care.

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Medication Errors Involving Reconciliation Failures

Poor communication of medical information at transition points of care has been cited as a cause of many medication errors. It is estimated that 46% of medication errors occur during the patient's admission or discharge from a clinical unit and/or hospital.¹ Other studies have shown discrepancies in medication orders to be frequent, and as many as half of all hospital medication errors occur

at the interfaces of care.^{2,3} The Joint Commission, Institute for Healthcare Improvement, Massachusetts Coalition for the Prevention of Medical Errors, the Agency for Healthcare Research and Quality, and others have developed varying but similar definitions for medication reconciliation that, in general, describe the activity as:

A process for obtaining and documenting a complete and accurate list of a patient's current medications upon admission and comparing this list to the physician's admission, transfer, and/or discharge orders to identify and resolve discrepancies.

In September 2004, USP added 3 **Causes of Error** to the MEDMARX[®] reporting program to capture error events involving medication reconciliation failures. During a 10-month period (September 2004 - July 2005) there were 2,022 medication errors reported to MEDMARX that involved a reconciliation issue. Approximately 22% (n = 456) of the reconciliation-related errors occurred during the patient's admission to the facility, 66% (n = 1,329) occurred during the patient's transition/transfer to another level of care, and 12% (n = 237) occurred at the time of discharge. A little more than 50% of the medication errors were intercepted (Category B) before reaching the patient for *Admission* and *Transition* reconciliation failures (Table 1). In contrast, only 28% of *Discharge* reconciliation errors were intercepted. Despite their higher interception rate, the number of harmful errors (Categories E-I) was greater for both *Admission* (n = 14) and *Transition* (n = 15) reconciliation failures.

Table 1. Distribution of Reconciliation Errors by Error Category*

Error Category	Admission		Transition		Discharge	
	n	%	n	%	n	%
Potential Error						
A	22	5	29	2	8	3
Intercepted Error						
B	231	51	710	53	66	28
Error Reaches Patient, No Harm						
C	167	37	517	39	156	66
D	22	5	58	4	5	2
Error, Harm						
E	10	2	9	1	1	0.42
F	4	1	4	0.3	1	0.42
G	0	0	0	0	0	0
H	0	0	0	0	0	0
Error, Death						

I	0	0	2	0.15	0	0
Total	456	100%	1,329	100%	237	100%

^aFor complete error category definitions see www.nccmerp.org.

When examining the different **Types of Error** associated with all reconciliation failures combined (i.e., Admission, Transition, and Discharge), just three error types (i.e., *Improper dose/quantity*, *Omission error*, and *Prescribing error*) comprised 70% of all **Type of Error** selections. The highest percentage of *Prescribing errors* (49%) occurred with admission reconciliation failures. *Improper dose/quantity* and *Extra dose* errors most often occurred with transition reconciliation failures and the highest percentage of *Omission errors* (76%) occurred with discharge reconciliation failures (Table 2).

Table 2. Types of Error for Medication Reconciliation Failures^a

Types of Error	Admission	Transition	Discharge
	%	%	%
Improper dose/quantity	55	73	62
Prescribing error	49	36	27
Omission error	35	36	76
Wrong drug	17	22	5
Wrong time	10	17	3
Extra dose	10	21	1
Wrong patient	5	4	0
Mislabeled	<1	3	2
Wrong administration technique	<1	1.4	0
Wrong dosage form	<1	2	0
Deteriorated product	<1	<1	<1
Prepared incorrectly	<1	1	0

^aBased on 1,978 records associated with 4,208 selections.

When examining the **Causes of Error** associated with all reconciliation failures combined, *Performance deficit* was cited in nearly 88% of the records (Table 3). *Transcription inaccurate/omitted*, *Documentation*, and *Communication* were also frequently reported **Causes of Error** associated with reconciliation failures. Compared to the larger MEDMARX data set, the percentages of the 10 most frequently reported **Causes of Error** are much greater for events involving reconciliation failures. This suggests that these leading causes (*Performance deficit*, *Transcription*, *Documentation*, *Communication*, etc.) are more frequently associated with error events involving

reconciliation failures. The largest percentage difference between a **Cause of Error** in a reconciliation-related event and the larger MEDMARX data set was with *Workforce disruption* (80.4% versus 4.0% respectively).

Table 3. Leading Causes of Error for Medication Reconciliation Failures

Causes of Error	Reconciliation Failures ^a		% MEDMARX ^b
	n	%	
Performance deficit	1,610	87.9	38.9
Transcription inaccurate/omitted	1,542	84.2	10.7
Documentation	1,528	83.4	12.1
Communication	1,511	82.5	9.3
Workflow disruption	1,473	80.4	4.0
Monitoring inadequate/lacking	1,154	63.0	2.3
Written order	783	42.7	5.7
Computer entry	748	40.8	12
Policy/Procedure not followed	746	25.6	16.8
Information management system	469	22.4	0.5

^aBased on 1,832 records and 14,601 selections for the 10-month period 9/04 - 7/05.

^bBased on all 248,733 records submitted to MEDMARX for calendar year 2004.

Case Examples of Admission Reconciliation Failures

- A patient's home medication was recorded as Coreg[®] 25 mg twice a day on the admission order sheet when the patient was actually only taking 6.25 mg twice a day at home. The patient received 4 doses of the excessive strength and developed leg edema. A leg ultrasound test was ordered to rule out deep vein thrombosis before the error was discovered.
- A nursing home patient was receiving propranolol 20 mg/5 mL twice a day, but the admitting orders were written as propranolol 20 mg/ mL give 5 mL (which equates to 100 mg) twice a day. The patient received five doses of the 100 mg strength before the error was discovered.
- A patient was admitted to a hospital from a home healthcare agency. The list of medications provided by the agency did not completely match the list provided by the patient's family physician (i.e., the antihypertensive agent Lopressor[®] was not listed by the agency as one of the medications that the patient was currently taking). Therefore, Lopressor was not initially

ordered. The patient developed atrial fibrillation shortly after hospital admission and required a transfer to the ICU. A cardizem infusion was started and the patient's family physician became aware that the patient had not been receiving their anti-hypertensive medication and initiated an order for the Lopressor.

Case Examples of Transition/Transfer Reconciliation Failures

- A patient who had a prior history of several arterial stent replacements was taking aspirin, enoxaparin, and clopidogrel. These drugs were placed on hold for a surgical procedure to amputate one of the patient's toes. Inadvertently, the three drugs were not reordered by the physician post-op and two of the patient's coronary arteries with stents later became 100% occluded and the patient expired.
- A patient who was receiving two IV infusions (eptifibatide and normal saline) was temporarily transferred to another service for a procedure. The patient returned to the original primary care unit when it was discovered that the IV infusion pump rates for the two products had been inadvertently switched.
- Prior to transfer from the ICU to a step-down unit, a patient received their morning doses of scheduled medications. The administration of these same medications was incorrectly repeated soon after the patient arrived on the new unit due to unclear documentation and communication.

Case Examples of Discharge Reconciliation Failures

- Discharge orders listed glucophage 500 mg, 1 tablet twice a day. A nurse transcribed the order as glucophage 500 mg daily on the discharge instructions. A home health nurse used the discharge instructions to prepare the patient's medication dispensing box in the home. Several days later, the patient was readmitted to the hospital with a blood sugar level of 387, chest pain, shortness of breath, and atrial fibrillation with a rapid ventricular response. The patient was upset and told hospital staff that the "home health nurse changed my medications." The patient required sub-shock insulin to achieve normal blood glucose levels and was placed back on the twice-a-day dosing schedule.
- After being discharged, the patient returned to the emergency department several days later complaining of shortness of breath. Hospital staff found discharge prescriptions for antibiotics that were left in the chart and never given to the patient.
- A patient's Primidone[®] (barbiturate for epilepsy) was discontinued during the patient's hospitalization and not renewed upon discharge to a skilled nursing facility. The patient later experienced 3 grand mal seizures while at the skilled nursing facility.

Suggestions for Improving Medication Reconciliation*

1) Develop a formal and systematic approach to reconciling a patient's medications across the continuum of care with multidisciplinary input and representatives from key organizational departments/services (e.g., admitting

department, emergency department, critical care areas, radiology, peri-operative areas, general medical/surgical units, inpatient/outpatient pharmacy, risk management, quality improvement, and related ambulatory clinics).

2) Create policies and procedures that outline the roles, tasks, and steps in the reconciling process.

3) Adopt a standardized form for reconciling medications; place this form in a consistent, highly visible location within the patient's chart.

4) Assign responsibility for resolving variances in medication orders to someone with sufficient expertise. Establish a context for shared accountability; outline how, when, where the ordering physician, nurse, and pharmacist work together on reconciliation issues.

5) Establish specified time frames within which medications should be reconciled.

6) Provide clinicians ready access to drug information and a pharmacist consult if and when needed.

7) Improve access to complete medication lists at the point of admission; improve outreach and contact information for community pharmacies, physician offices, ambulatory clinics, nursing homes, home healthcare agencies, assisted living centers, and hospitals.

■ Based on strategies published by the Massachusetts Coalition for the Prevention of Medical Errors available at: www.macoalition.org/initiatives.shtml

Additional sources for medication reconciliation improvement strategies can be found at:

- Institute for Healthcare Improvement (www.ihl.org)
- Institute for Safe Medication Practices (www.ismp.org)
- Joint Commission (www.jcaho.org)
- USP Personal Medication Organizer Form ([click here](#))

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1. Bates D, Spell N, Cullen D, et al: The costs of adverse drug events in hospitalized patients. JAMA 277;307-311, 1997.
 2. Marino BL, Branowicki P, Bennett JA, et al. Evaluating process changes in a pediatric hospital medication system. Outcomes Management 2002;6(1):10-5; quiz 6.
 3. Rozich JD, Howard RJ, Justeson JM, Macken PD, Lindsay ME, Resar RK. Standardization as a mechanism to improve safety in health care. Joint Commission Journal on Quality and Patient Safety 2004;30(1):5-14.



1. JCAHO Updates

[Transforming Medication Error Data into Meaningful Information: Advanced Workshop](#)

Series: Back by Popular Demand - Joint Commission Resources and USP once again are offering day-long, interactive workshops that train patient safety practitioners to make sense of error data and assess the impact of risk-reduction strategies. This advanced workshop series will utilize demonstrations and case-study examples to provide attendees with specific “hands-on” experiences. There are only two dates left to participate in this interactive program:

- November 2 in Rockville, MD (at USP Headquarters)
- December 3 in Las Vegas, NV (Preceding the ASHP meeting)

Participants will:

- Identify various error data collection methods and learn what minimum elements are needed to capture meaningful information on medication error events within the healthcare facility
- Learn to prioritize error-reduction strategies
- Learn various methods to analyze data collected through medication error reports
- Translate findings of medication error reports into meaningful information through interpretation of data findings and in their presentation to committees and staff
- Apply JCAHO Medication Management Standards and 2006 National Patient Safety Goals as they relate to the promotion of Medication Safety
- Evaluate the potential impact of proposed actions taken in response to error

For more information and to register call- JCR Customer Service toll free at 877-223-6866 or go on-line at [click here](#).

JCAHO's Statistics on Sentinel Events Have Been Updated: The total number of sentinel events reviewed by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) since 1995 is 3197. More, and recently updated, statistics of the sentinel events reported to JCAHO can be found on the JCAHO Web site. [Click here to read more](#).

2. Survey Finds Little Improvement in Pharmacy Computer Systems

In late August, ISMP announced the results of its most recent (2005) survey findings on hospital pharmacy computer systems and found that in many areas, the computer systems performed less reliably than in 1999. Included among the findings—less than half of the computer systems were able to detect orders for medications that exceeded a safe maximum dose and when unsafe orders were detected, an average of 9 in 10 systems allowed the user to override the serious warnings, in most cases by simply pressing a function key. <http://www.ismp.org/PR/PR20050830.pdf> (Press release)
<http://www.ismp.org/s/survey200505R.asp> (Survey results)

3. Medication Discrepancies are Prevalent in the Elderly

A study examined the prevalence and contributing factors associated with medication discrepancies that may arise upon a patient's discharge from the hospital to the home. The study's findings suggest that these discrepancies are

more prevalent in patients with large numbers of prescriptions and with a diagnosis of congestive heart failure. Rehospitalization occurred more frequently among patients experiencing a medication discrepancy.

<http://archinte.ama-assn.org/cgi/content/abstract/165/16/1842?etoc>

4. FDA Updates

December Hearings on Drug Safety: The Food and Drug Administration (FDA) has scheduled hearings for December 7 and 8 in Washington, D.C. to evaluate and receive comment on the current guidelines for communicating drug information. The hearings will focus on the Center for Drug Evaluation and Research's current outreach strategies. Public input is welcome at the hearings. In particular, the FDA wants to know whether the information currently presented is what people want to know about drug safety, and what other information could be provided to help consumers make better informed decisions.

<http://www.fda.gov/bbs/topics/answers/2005/ans01367.html>

Electronic Notification for Drug Safety and Recall Notices: The FDA recently told the pharmaceutical industry that manufacturers may use e-mail and "other electronic methods" to distribute information about product safety and recalls. [Click here to read more.](#)

5. Pharmacy Linked to Multiple-State Outbreak of Serratia Infections

The Centers for Disease Control (CDC) has notified the FDA that several cardiothoracic surgery patients at a New Jersey hospital developed *S. marcescens* bloodstream infections after receiving magnesium sulfate intravenous solution made by a particular compounding pharmacy. News of this was first made public in March and information presented at a scientific meeting this month indicates investigators have linked the magnesium sulfate intravenous solutions made by the compounding pharmacy to 18 cases of bloodstream infection in five states. <http://www.ashp.org/news/ShowArticle.cfm?id=13039>

6. Errors with Magnesium Sulfate in Obstetrics Units Continue

A recent report from the Institute for Safe Medication Practices reviews an article on errors with magnesium sulfate infusions in obstetrics units and offers eight recommendations for reducing the risk of harm from this therapy.

<http://www.ismp.org/MSAarticles/20051020.htm>

7. Reduction in Nursing Shift Hours Considered a Strategy to Reduce Errors

Hospitals across the country are examining their staffing policies and cutting extra long shifts to reduce medical errors. Some research has shown that long shifts for nurses and other healthcare workers may lead to increased medical errors.

One study compared the impairment from fatigue to that of alcohol. [Click here to read more.](#)

8. Neuromuscular Blockers Continue to be Misused

In a recent newsletter, the Institute for Safe Medication Practices (ISMP) provides examples of errors involving neuromuscular blocking agents and outlines recommendations to help hospitals reduce the risk of misusing these agents. <http://www.ismp.org/MSAarticles/20050922.htm>

9. NQF Releases Plan for Improving Patients' Medication Use

Patient adherence to treatment recommendations is a longstanding problem across the continuum of care. Both healthcare providers and patients must work together to ensure that patients follow treatment recommendations once they leave the care setting. The National Quality Forum recently released the 108-page report "Improving Use of Prescription Medications: A National Action Plan" to help practitioners and patients make significant progress on this issue. <http://www.qualityforum.org/txMedUseBEACH09-28-05.pdf>

USP Medication Error Reporting Programs:



MEDMARX[®]—USP's comprehensive, Internet-accessible, anonymous medication errors reporting program, and quality improvement tool. The program facilitates productive and efficient documentation, tracking, trending, and prevention of medication errors.



Medication Errors Reporting (MER) Program—presented in cooperation with the Institute for Safe Medication Practices, this nationwide program makes it possible for health professionals to report medication errors confidentially and anonymously to USP.

Other USP patient safety resources:

- [MEDMARX Annual Data Summary reports](#)—provides readers with a wealth of information on reported error events including patterns in the types, causes, and level of harm associated with medication errors.
- [Understanding and Preventing Medication Errors: A Resource for Healthcare Practitioners](#)—a CD toolkit with practical guidelines, forms, and templates to help healthcare facilities improve error-reduction initiatives.
- [Advancing Patient Safety in U.S. Hospitals: Basic Strategies for Success](#)—a book in which hospitals share stories about how they reduced medication errors and promoted safer patient care.
- Medication Safety Pocket Reference—a pocket-sized reference booklet containing listings of similar drug names and dangerous abbreviations that could cause medication errors. Contact custsvc@usp.org and ask for item #3227702.
- Similar Drug Names Poster—a wall poster for easy reference listing look-alike and sound-alike drug

names known to cause confusion and potential medication errors when handwritten or communicated verbally. Posters are packaged in quantities of 1 (item # 3728251) 10 (item # 3728252) and 50 (item # 3728253). Contact custsvc@usp.org and ask for the appropriate item number.

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