



Breakdowns in the Medication Reconciliation Process

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ABSTRACT

Pennsylvania Patient Safety Authority analysts identified 501 reports involving breakdowns in the medication reconciliation process with event dates between November 1, 2011, and November 31, 2012. Analysts reviewed these reports to classify the events by type of reconciliation, event type, and possible causes and contributing factors. The majority of events occurred during admission medication reconciliation (69.3%, n = 347). Events most often originated during prescribing (40.3%, n = 202) and transcribing (26.9%, n = 135). Drug omission was the most frequently reported (26.7%, n = 134) event type overall. Other top event types included wrong dose and additional drug or dose. Important risk reduction strategies include standardizing processes, clearly defining the roles and responsibilities of staff involved in the medication reconciliation process, using a standardized medication reconciliation form with a scripted list of questions or prompts, and engaging patients when obtaining their history and determining treatment. (Pa Patient Saf Advis 2013 Dec;10[4]:125-36.)

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INTRODUCTION

Medication reconciliation is a process of comparing the medications a patient is taking and should be taking with newly ordered medications to identify and resolve discrepancies.^{1,2} In other words, the process involves collecting an accurate list of the patient's medications, ensuring the medications collected and ordered are correct and appropriate for the patient, and reviewing any changes in therapy with each change in level of care. The goals of medication reconciliation are to obtain accurate and complete medication information for a patient and to use the information within and across the continuum of care to ensure safe and effective medication use.³

This process involves obtaining a detailed history of the medications that a patient was taking at home or during the previous level of care, including the drug name, strength, dose, route of administration, frequency, and the date and time when the last dose was taken. Having a complete and comprehensive medication history is critical and allows clinicians to reconcile it against the patient's current and newly ordered medications to identify discrepancies such as duplications, omissions, and interactions and minimize potential adverse drug events.

Medication errors are frequent during transitions of care due to inadequate communication and inadvertent omission of information.⁴ For example, medication errors can occur while taking the medication history due to dependence on patient or caregiver recall. This process is further complicated by reliance on healthcare providers who have other primary responsibilities. Lack of a complete and accurate medication history may compromise a provider's ability to prescribe an effective medication management plan. With the majority of the patients taking more than one medication prior to hospital admission, there is potential for providers to overlook at least one medication when reconciling patients' home medications upon admission.^{5,6} In addition, there is a positive correlation between the number of medications a patient is taking and the number of medications missed during the process of taking the medication history.⁵

This analysis serves to uniquely review medication error events reported by Pennsylvania healthcare facilities to the Pennsylvania Patient Safety Authority in order to identify the types of medication events associated with the medication reconciliation process, identify trends and factors contributing to the events, and provide risk reduction strategies to prevent these events from occurring.

METHODS

While reviewing reports submitted to the Authority, analysts have the opportunity to further classify reports using a "monitor code" for future querying opportunities. Analysts queried the Authority's Pennsylvania Patient Safety Reporting System database for reports assigned the monitor code "PI6," representing reports identified as events involving breakdowns during medication reconciliation. In addition, the event descriptions were queried for the phrases "reconcile" and "reconciliation" to identify reports that may involve medication reconciliation that were not assigned the "PI6" monitor code.

The initial query yielded 4,965 reports submitted to the Authority from June 2004 through November 2012. Analysts narrowed the time period to focus only on reports with event dates from November 2011 through November 2012, which generated 681 reports. After eliminating reports that were not applicable (e.g., "during process of reconciling specimen with requisition, the lab technician noted patient's specimen to be mislabeled"), 501 reports were analyzed in detail to identify trends and contributing factors.

ANALYSIS

Despite the variety of ways in which breakdowns occurred during medication reconciliation and the number of events that actually reached the patient, few resulted in patient harm. Categorization of the events by harm score, which is adapted from the National Coordinating Council for Medication Error Reporting and Prevention harm index,⁷ shows that 67.3% (n = 337) of the events reached the patient (harm score = C to I), 17.4% (n = 87) of the events reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm (harm score = D), and 3.6% (n = 18) of the events resulted in patient harm (harm score = E to I).

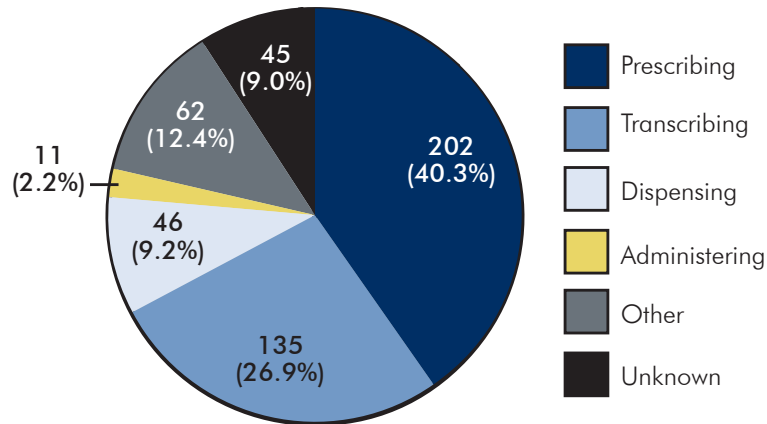
Likewise, analysts categorized the events according to the node of the medication-use process in which the event took place. More (40.3%, n = 202) reported events originated in the prescribing node than any other node. See the Figure for a complete breakdown of events by node.

The care areas in which the events occurred were distributed across many units. The top five care areas were medical-surgical unit (21.2%, n = 106), emergency department (ED) (12.8%, n = 64), telemetry (7.2%, n = 36), medical unit (5.8%, n = 29), and pharmacy (4.6%, n = 23). As older patients often take more medications and access medical service more frequently, it was not unexpected that the majority of patients (55.7%, n = 279) involved in these events were age 65 or older. Only 3.0% (n = 15) of patients were 18 or younger. More than 89.2% (n = 447) of the reports were reported as medication errors, only one was reported as an adverse drug reaction, and the remaining were submitted as other types of reportable events.

Medication Reconciliation by Care Transition

Authority analysts categorized the events according to care transition (i.e., admission,

Figure. Medication-Reconciliation-Related Events That Occurred from November 1, 2011, through November 31, 2012, by Node, as Reported to the Pennsylvania Patient Safety Authority (N = 501)



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transfer, discharge). Nearly 70% (n = 347) occurred during medication reconciliation upon admission, 10.0% (n = 50) during medication reconciliation upon discharge, and 8.6% (n = 43) during medication reconciliation upon transfer. Analysts were unable to determine the care transition in 12.2% (n = 61) of the events because there was insufficient information contained within the event reports.

Examples for each care transition are as follows:

Admission

Based on the medication history information from patient's family, atenolol 150 mg was prescribed. Pharmacy caught the error, saying that the dose of atenolol was too high. After checking with patient's outpatient pharmacy, [it was learned that] the patient was actually taking Avapro® [irbesartan] 150 mg. Patient did not receive the wrong medication.

Transfer

When the patient was transferred from the PACU [postanesthesia care unit] to the ICU [intensive care unit] to the floor, medication reconciliation was not conducted when the patient went from ICU to the floor.

Discharge

Patient was taking Altace® [ramipril] at home, which was therapeutically interchanged to lisinopril by pharmacy. Upon discharge, Altace was discontinued and lisinopril was listed as a new medication. Patient went home with new prescription for lisinopril but already had Altace at home, leading to [therapeutic] duplication.

When analyzing the event description of each event report, analysts identified a broad spectrum of event types that occurred during care transitions. The Table provides a breakdown of the top five event types by care transition. Overall and for each care transition, drug omission, wrong dose, additional drug or dose, unknown, and wrong drug were the most common event types. Drug omission was the most frequently reported event type overall and with each care transition except transfers. Insufficient information was provided in 12.2% (n = 61) of the event reports to determine the type of event that occurred.

Drug Omissions

An omitted or missed dose may contribute to therapeutic failure and deterioration of the patient. Omissions, including dose

Table. Top Five Event Types Associated with Medication-Reconciliation-Related Events That Occurred from November 1, 2011, through November 31, 2012, as Reported to the Pennsylvania Patient Safety Authority

EVENT TYPE	NO. OF EVENTS (%) BY CARE TRANSITION				
	Overall (N = 501)	Admission (N = 347)	Transfer (N = 43)	Discharge (N = 50)	Unknown (N = 61)
Drug omission	134 (26.7)	90 (25.9)	11 (25.6)	12 (24.0)	14 (23.0)
Wrong dose	102 (20.4)	75 (21.6)	2 (4.7)	11 (22.0)	14 (23.0)
Additional drug or dose	90 (18.0)	55 (15.9)	14 (32.6)	9 (18.0)	12 (19.7)
Unknown	61 (12.2)	31 (8.9)	13 (30.2)	8 (16.0)	9 (14.8)
Wrong drug	40 (8.0)	31 (8.9)	1 (2.3)	4 (8.0)	4 (6.6)

or drug omissions, were the second most common (26.7%, n = 134) type of event identified by analysts. The greatest number of omission events occurred during the prescribing phase (35.1%, n = 47), while 17.2% (n = 23) occurred during the transcription phase. Examples are as follows:

A patient was admitted for a surgical procedure. Home medications were not ordered. Patient's seizure medication was not given. The patient had a seizure. Physician contacted and ordered 2 mg Ativan® [LORazepam] and now dose of 90 mg IV [intravenous] push phenobarbital.

The attending physician admitted a patient and did not perform medication reconciliation. The patient was admitted without medications prescribed. The patient was without a medication list and only remembered Colace® [docusate sodium] stool softener as a medication. Two days later, it was discovered that the medication reconciliation was not done [because] the attending thought the resident had completed the history and physical and medication reconciliation.

The patient was admitted at end of the evening shift. Medications were not reconciled by doctor during overnight or day shifts, although the overnight nurse was informed of the patient's diabetes, hypertension, and past stroke history and told to call the

on-call doctor. The patient received no meds until evening shift.

A lack of detail in the event reports limited the analysts' ability to identify specific contributing factors to the drug or dose omission events. Analysts noted that in 20.9% (n = 28) of the events, the medication reconciliation form or documentation was never communicated or transmitted (e.g., faxed) to the pharmacy department or entered into the computer system. The reason for this breakdown in communication was not noted in the reports. Nearly 19% (n = 25) of the event reports simply described that the omission occurred when the drug or dose was omitted from the medication reconciliation documentation. Medication reconciliation was not completed for unspecified reasons in 13.4% (n = 18) of the events.

Roughly 18% (n = 24) of event reports either did not provide a drug name or indicated that a drug name was unknown, not documented, or other. Multiple medications were involved in 8.2% (n = 11) of the reports. Details as to the specific medications involved were not provided in the reports.

Cardiovascular drugs (e.g., amLODIPine, digoxin, diltiazem) were cited in 16.4% (n = 22) of the events, and antiplatelet or anticoagulant products were involved in 9.0% (n = 12) of the events. Examples are as follows:

A patient's blood pressure elevated on the day of anticipated discharge due to

home medications not being reordered on admission causing a delay in discharge. This error was caused by the admission reconciliation form not being completed and transcribed as an order form. The patient was restarted on home medications and discharged a day later.

A patient was discharged without Lopressor® [metoprolol] being ordered due to incomplete medication reconciliation process. The patient went into rapid atrial fibrillation, which necessitated readmission two days later.

Pradaxa® [dabigatran etexilate] was continued on medication reconciliation but not profiled. The error was detected during chart check after [two] doses were missed. Patient has a history of atrial fibrillation. The attending physician was notified. There were no adverse effects noted, and the drug was started promptly.

Wrong Dose

When breakdowns occur with the medication order, patients are at risk of receiving an incorrect dose or medication. Analysts initially identified "wrong medication order" as the most frequently reported (41.7%, n = 209) type of event associated with the medication reconciliation process. When drilling down further into these reports, nearly half (48.8%, n = 102) involved a wrong dose of medication, which was the second most frequent



event type overall. Similar to previously mentioned drug omission events, the majority of wrong-dose events originated during the prescribing (49.0%, n = 50) and transcription (27.5%, n = 28) phases. Examples are as follows:

The patient takes metoprolol tartrate 100 mg q am [every morning] and 50 mg q pm [every evening]. [Medication was] reconciled and ordered as [metoprolol tartrate] 150 mg q am. [Metoprolol tartrate] 150 mg was given in morning. Patient was then taken to cardiology, [where the patient] became severely symptomatically bradycardic and hypotensive. Fluids were administered [as well as] ondansetron for nausea. [Staff] discussed the discrepancy with cardiology. Metoprolol held.

During previous hospital stay, a patient received Lantus® [insulin glargine] 6 units daily at bedtime. The discharge summary notes Lantus 60 units daily at bedtime. Discharge instructions and discharge prescription listed Lantus 6 units daily at bedtime. The patient was admitted a month later, and ED personnel did not have Lantus listed as a home medication. History and physical notes Lantus 60 units daily at bedtime, and Lantus 60 units daily at bedtime was ordered. On day one, the patient's evening POC [point of care] blood glucose level was 172; Lantus dose given. On day two, the patient's evening POC blood glucose level was 161; Lantus dose given. On day three, the patient's morning POC blood glucose level was 59, and the corresponding morning lab reported blood glucose level of 50. The patient was administered dextrose 15 g PO [by mouth]; repeat POC was 85. Lantus dose was discontinued. The patient's evening blood glucose level was 60. The patient was administered dextrose 15 g PO; repeat POC

was 85. The patient had no adverse outcomes beyond measures to reverse hypoglycemia.

Most often (65.7%, n = 67), wrong-dose events involved documentation errors during the medication reconciliation process. For instance, 57.8% (n = 59) of wrong-dose events resulted from the incorrect dose recorded by the practitioner during medication reconciliation. Breakdowns in the accuracy of the patient's recall of his or her medications contributed to these documentation errors. Another 18.6% (n = 19) of the events resulted from an order entry error in a computerized prescriber order entry system or pharmacy computer system.

Analysts found a variety of medications involved in the wrong-dose events. Insulin products, a category of high-alert medications,^{8,9} were involved in 8.8% (n = 9) of the events. It should be noted that 33.3% (n = 3) of the insulin reports appear to involve the misinterpretation of the insulin concentration 100 unit/mL—as is often printed on hospital and long-term care discharge instructions as well as outpatient prescription labels¹⁰—as the patient's specific dose. Examples are as follows:

A patient was admitted to general rehab. The admission orders included an order for Lantus 100 units daily and 100 units at bedtime. During acute care admission, the patient had been receiving 35 units daily and 25 units at bedtime. I spoke with admitting resident to change [the Lantus dose] back to previous dosing. Per the admitting resident, the patient's discharge instructions stated dose as 100 units. Upon review of the discharge instructions, the medication appears as follows: "Medication Name/Strength column: Insulin Glargine (Lantus) (Insulin Glargine 100 units/mL Subcutaneous Solution)" and the "How much do I take?" field is blank.

A patient was on Levemir® [insulin detemir] 100 units/mL at home. When medication reconciliation was completed, the physician called an order to substitute Lantus for Levemir, but the dose was transcribed as 100 [units] instead of 10 units. The patient received 100 units of Lantus insulin. The physician was notified. The patient had a decrease in blood sugar that responded to dextrose.

Other medications involved in wrong-dose events include metoprolol tartrate and metoprolol succinate (6.9%, n = 7), buPROPrion-containing products, including extended-release formulations (2.9%, n = 3), and oral hypoglycemic agents (i.e., glipliZIDE, glyBURIDE, and glimepiride) (2.9%, n = 3).

Additional Drug or Dose

Inadvertent prescribing or administering of an additional or unnecessary drug can pose a risk to patients. Analysts identified that in roughly 18% (n = 90) of the events, patients nearly or actually received an additional drug. Over 46% (n = 42) of these events originated in the prescribing node of the medication-use process, while 22.2% (n = 20) and 16.7% (n = 15) originated in the transcription and dispensing nodes, respectively. Examples are as follows:

Upon retrospective review, it was noted that this patient was hyperkalemic upon admission, and kayexalate was prescribed and administered. Additionally, [the patient's] potassium supplement was inappropriately continued from the home medication list, [which] resulted in a refractory hyperkalemia. The condition was temporary, [and it was] treated with a second dose of kayexalate. The potassium supplement was discontinued.

Patient went to surgery, and after the procedure, the "OR/Transfer Medication Reconciliation" was printed and signed by surgery. One

minute later, the “Home Medication Reconciliation” was printed and signed by surgery, activating old medication orders that conflicted with the post-op orders. This created numerous medication order problems for nursing and pharmacy. The patient was on duplicate antisecretory medications, as well as different doses of antidepressants. The orders were evaluated by a hospitalist, and medication order issues were resolved. The patient, however, did experience new onset confusion, agitation, and bladder irritation [the day before the hospitalist resolved the issue]. Per the physician, he cannot rule out that it is medication-related.

The patient was admitted for hypertension, metoprolol was stopped, and labetalol was started. During the discharge medication reconciliation process, the provider indicated that the patient should start labetalol but also ordered the home medication of metoprolol. The patient required readmission for bradycardia.

The most frequent breakdown that occurred during these events were documentation errors (42.2%, n = 38). One key contributor involved the accuracy of the information practitioners accessed to determine the patient’s current medications. In 42.1% (n = 16) of the events, patients were ordered, and in some cases received, medications documented in previous admissions, on home medication lists, or on lists provided by other facilities when in fact the patient was no longer taking that medication. Examples are as follows:

Coumadin® [warfarin] was listed on the patient’s home medication reconciliation sheet. These meds were ordered by the ED physician. The patient and [the patient’s adult child] both stated that the patient no longer takes Coumadin. The patient did not receive any doses while in hospital.

A medication reconciliation form was completed in the ED and accepted as admission medication orders. As per policy, the medication reconciliation form [was] reviewed with the patient and the family at the time of admission. The family stated that Remeron® [mirtazapine] and Zoloft® [sertraline] had been discontinued in the skilled facility. Transfer medication sheets were reviewed, and both meds had been discontinued. The patient did not receive incorrect medications.

It was discovered by the medical doctor that the patient had the following meds on [the medication administration record]: doxycycline, metroNIDAZOLE, Pyridium® [phenazopyridine], and Bactrim® [sulfamethoxazole and trimethoprim]. The physician realized that the patient should not be getting these meds, as the patient no longer needs these with no UTI [urinary tract infection]. Apparently, the nurse and psychiatrist both reconciled these medications on admission, although the patient has not needed them. The patient was given these medications in the morning, as they were on the [medication administration record] to give. The patient did not have any sort of adverse reaction, and the medications were discontinued.

When the patient was admitted, the nurse reviewed the records that came with the patient to determine medications that the patient was receiving upon discharge from the referring facility. One record noted meds the patient received the day of discharge from the transferring facility prior to admission to this facility. This list was reviewed with the physician, and verbal orders were obtained from the physician for the medications reviewed. This list, however, did not match the discharge medication list record that was also in the admission papers, and this record

was overlooked. The next day, the physician reviewed all records and, in the reconciliation process, realized that an error was made. Three medications were ordered in error. One of the meds was Opana® [oxycodone], and one dose was given to the patient before the error was discovered. The patient did not have any apparent ill effects from the medication.

In other events involving documentation errors, medications from lists belonging to a different patient were ordered for a patient (15.8%, n = 6). Most often, the lists were provided by patients or other facilities. Examples are as follows:

A patient presented at ED with [the patient’s] son. The son gave the ED nurse the home medication list. The list included both the patient’s and patient’s spouse’s home medications. The nurse transcribed both the patient’s and spouse’s medications when completing the patient’s medication reconciliation. The admitting physician used the medication reconciliation list of home meds transcribed by the ED nurse to order medications for the patient. The patient received the spouse’s medication twice in error. The physician was notified. [There was] no apparent harm to the patient.

A patient [was transported] to ED from personal care facility (the patient was confused). Information (medication lists) was sent on the patient and another facility patient. When medication reconciliation was completed, the two [patients’] medication lists were combined to compile a medication list for admission. The physician reviewed the compiled list and ordered medications based on the list. The patient received [multiple doses of] the following medications from the other patient’s list: Ambien® [zolpidem], Seroquel® [quetiapine], Celexa® [citalopram], Ventolin® [albuterol] inhaler, Neurontin®



[gabapentin], OxyCONTIN® [oxyCODONE extended release], and Xanax® [ALPRAZolam]. During hospitalization, the patient was noted to be progressively lethargic. Rapid response was initiated, and the patient was treated and remained on the unit. Following a gastrointestinal procedure, the patient was transferred to ICU due to inability to fully wake up post sedation. Medications were adjusted, with order to hold for sedation. The remainder of hospital course was uneventful. Upon preparation for discharge, personal care facility [was] given report and medications [were] reviewed. Facility questioned medications and indications. Medication errors were discovered at that time. Patient [was] discharged back to facility in stable condition.

Prescribers indicated on medication reconciliation forms or in orders to “hold” doses of medications in 16.7% (n = 15) of event reports. However, either nursing or pharmacy staff missed the hold order. Similar to an article that appeared in the March 2006 Pennsylvania Patient Safety Advisory,¹¹ anticoagulants were in nearly a third (n = 4) of these events. An example is as follows:

Coumadin was placed on hold on medication reconciliation sheet. Coumadin was dispensed to floor with other medications. The nurse administered Coumadin, and when heparin lock was discontinued, the patient was noted to have increased bleeding time. The patient recalled that Coumadin was given night prior. The physician was notified. No other adverse effects [were noted]. Pharmacy [was made] aware, and medication was profiled but was not placed on hold as per medication reconciliation sheet.

Facilities indicated that 8.9% (n = 8) of additional drug or dose events involved

multiple medications. Cardiovascular drugs, primarily drugs used to treat hypertension, were involved in 17.8% (n = 16) of all the additional drug or dose events. The next largest group of medications noted in the event reports was anticoagulants and antiplatelets (14.4%, n = 13).

Wrong Drug

Wrong-drug events were the fifth most frequently reported (8.0%, n = 40) event type overall. Similar to the other top event types, analysts identified that most events originated during the prescribing (37.5%, n = 15) and transcription (37.5%, n = 15) phases of the medication-use process. Examples are as follows:

The patient was on HumuLIN® 70/30 [insulin NPH and insulin regular] 50 units BID [twice daily] at home. [On admission, the patient was] ordered HumuLIN® N [insulin NPH] 35 units BID. The patient received 1 dose of 35 units of HumuLIN N. [Staff] spoke with resident and the patient’s nurse to verify and correct.

Medication was transcribed from patient list to reconciliation [form] by nurse as amiodarone instead of amLODIPine. Earlier today, PCP [primary care physician] discussed this transcription error with nurse, and she thought PCP had crossed it off. It later became apparent that he had not.

Nurse transcribed a medication by history as isosorbide dinitrate 30 mg daily. Physician reconciled medication and pharmacist verified order. Night shift pharmacist questioned order on cart check. Physician contacted, and order changed to isosorbide mononitrate. Patient received one incorrect dose.

Medication information from a different patient was used to populate the medication reconciliation documentation and used to order and profile medications in 12.5% (n = 5) of the events. In some cases, the wrong patient’s list was forwarded by an outside facility from which

the patient was being transferred. In another case, the wrong patient’s medication reconciliation form was placed on the patient’s chart and completed by the prescriber ordering medications. Examples are as follows:

A patient presented to the facility with a medication list sent by a nursing home. The patient was placed on NPO [nothing by mouth] status. Medication reconciliation process was performed based on medication list sent from the nursing home. After administration of eye drops only, staff discovered that the med list was that of another patient from the nursing home.

When admitting a patient, the wrong patient medication reconciliation forms were placed on the patient’s chart and were filled out by nurse practitioners writing admission orders (prescribing error). The error was discovered by the nurse before the list was scanned to pharmacy and profiled. The physician was notified and correct medications were ordered; no harm to patient occurred.

Another factor that contributed to wrong-drug events was the use of inaccurate medication history information provided by the patient or the patient’s family either on a printed list or verbally. This occurred in 7.5% (n = 3) of the wrong-drug events. An example is as follows:

The patient’s personal home list of medications lists tiazepam 15 mg PO daily as a home medication. Admitting nurse entered in computer as diazepam 15 mg daily. Pharmacy took order off as diazepam 15 mg PO daily morning meds given. The patient was unsure if she was on Valium® (diazepam) or not. Nurse double-checked home medication list and confirmed as home medication. The patient’s friend gave home list of medications provided at time of admission. Medication was listed as

tiazepam. When asked if that was the correct medication, the patient stated it was her sleeping pill, Restoril® (temazepam).

Confused drug names, or drug names with look-alike or sound-alike similarities, contributed to at least 35.0% (n = 14) of the events. It should be noted that while the event reports do not specifically cite look-alike or sound-alike names as contributing factors, analysts identified that some of the drug name pairs involved have a long, documented history of confusion and mix-ups.¹² For example, insulin products were involved in 42.9% (n = 6) of these look-alike name errors. Specific pairs involved in these events include HumuLIN 70/30 and HumuLIN N; HumaLOG Mix® 75/25 (insulin lispro protamine and insulin lispro) and HumuLIN 70/30; NovoLIN® N (insulin NPH) and NovoLOG® (insulin aspart); HumaLOG® (insulin lispro) and HumuLIN N; HumuLIN 70/30 and HumaLOG; and Levemir and Lantus. Other examples of drug name pairs involved in these events include amitriptyline and nortriptyline; isosorbide dinitrate and isosorbide mononitrate; NIFEedipine and niCARDipine; and Zyrtec® (cetirizine) and Zyrtec-D® (cetirizine and pseudoephedrine).

RISK REDUCTION STRATEGIES

Medication reconciliation conducted at all care transitions, including temporary transfers to operating rooms or diagnostic testing areas, can improve patient safety. Maintaining the most up-to-date patient medication record remains a challenge, particularly if an electronic patient medication record is not available. Healthcare facilities can strive to identify systems-based causes of the events associated with the medication reconciliation processes and implement effective risk reduction strategies to prevent harm to patients.

Standardizing the workflow processes involved in medication reconciliation and taking steps to improve the completeness

and accuracy of a patient's current medication history can reduce the risk of medication errors, including those described in this article. Consider the strategies described in this section, which are based on a review of events reported to the Authority, observations from the Institute for Safe Medication Practices, and recommendations in the literature. Also, a number of organizations have made tools and resources available to healthcare facilities to aid in the successful implementation of medication reconciliation. A selection of these resources can be found in "Resources to Aid in the Successful Implementation of Medication Reconciliation."

RESOURCES TO AID IN THE SUCCESSFUL IMPLEMENTATION OF MEDICATION RECONCILIATION

A key tenet in medication error prevention is to learn from other organizations and facilities. Listed below are a number of organizations that provide tools and resources to healthcare facilities to aid in the successful implementation of medication reconciliation.

- Agency for Healthcare Research and Quality (AHRQ). AHRQ's Clinical Handoffs (MATCH) Toolkit for Medication Reconciliation provides a step-by-step guide to improving the medication reconciliation process. See <http://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/match/matchintro.html>.
- American Society of Health-System Pharmacists (ASHP). ASHP's toolkit includes examples of programs, tools, and forms that have been implemented successfully in other organizations. Access the tool at http://www.ashp.org/Import/PRACTICEANDPOLICY/PracticeResourceCenters/PatientSafety/ASHPMedicationReconciliationToolkit_1.aspx.
- Institute for Safe Medication Practices Canada (ISMP Canada).

Standardized Process for Obtaining and Communicating Complete and Accurate Medication History

- The collection of a complete, accurate, single medication list, to be shared and used by all disciplines, at admission or at an initial point of entry into the system is a cornerstone of any successful reconciliation process.¹³ Complete documentation of all patient medications taken at the time of admission, including the name of the drug, dose, frequency, route, purpose of the medication,

ISMP Canada provides information and access to tools and resources for both healthcare facilities and patients on their website at <http://www.ismp-canada.org/medrec>.

- Partnership for Patient Care. This collaborative between the Healthcare Improvement Foundation, Independence Blue Cross, and ECRI Institute provides a report on the results and benefits of a regional failure mode and effects analysis on medication reconciliation. Access the report at https://www.ecri.org/Documents/Patient_Safety_Center/PPC_Medication_Reconciliation.pdf.
- World Health Organization (WHO). WHO's *Assuring Medication Accuracy at Transitions in Care Standard Operating Protocol*, a component of the High 5s Project, provides information about medication reconciliation, including the problem, strength of evidence that supports the solution, and potential barriers and unintended consequences. See <http://www.high5s.org/bin/view/Main/WebHome>.



and last dose taken,¹⁴ is important for successful medication reconciliation.¹⁵ To collect medication history, during the admission verification process, consider using a standardized form (either electronic or paper-based) that includes a scripted list of questions or prompts for the patient or the caregiver. Include a checklist on the form to ensure that the practitioner asks the patient about prescription and over-the-counter medications, vitamins, and dietary or herbal supplements that the patient may be taking. Design the checklist to remind the practitioner to also ask the patient about non-oral and non-parenteral medications, including patches, inhalers, topical products, eye drops, ear drops, depot injections, and drug-eluting implantable devices that may not be readily identified by patients as medications. Reviewing the labels of any prescription containers a patient brings and discussing how the medications are currently being used can help improve the accuracy of the information collected. Including the patient's community pharmacy contact information on the medication reconciliation form will enable pharmacist clarification when needed, keeping in mind that a patient may use more than one pharmacy.^{15,16}

- Stress to all staff, including prescribers, nurses, and pharmacists, the importance of following the standardized process to reduce the risk of medication errors and patient harm.
- Work to eliminate documentation of medication reconciliation information on multiple assessment tools (e.g., history and physical forms, anesthesiologist's notes, preprocedural assessment sheets).¹³
- Standardize patient identification processes such that all staff,

including prescribers, nurses, and pharmacists, utilize and verify two reliable patient identifiers to improve the accuracy of patient identification during medication reconciliation.¹⁷ Verify the patient identity recorded on documentation sent from outside facilities is a correct match to the patient being treated.

- Consider minimizing, excluding emergent situations, the writing or entry into electronic prescribing systems of admission orders by prescribers until a complete and accurate medication history has been compiled. This can help limit potential conflicts throughout the admission should the patient's home medication and dose be determined to be different than what was ordered upon admission.
- Orders to hold a medication can lead to errors.¹¹ For example, indications to hold orders may be missed by nursing or pharmacy staff, resulting in medications being administered when not intended by the prescriber. A safer practice is for prescribers to discontinue the medication and then order the medication when it is to be started.

Define Roles and Responsibilities

- Clearly define the roles and responsibilities of staff, including prescribers, nurses, and pharmacists, involved in the medication reconciliation process.^{13,18} Take steps to foster teamwork among the disciplines.
- Physician and prescriber engagement with patients and other practitioners is important in ensuring a successful medication reconciliation process.¹⁹ Medication reconciliation is the responsibility of all physicians and prescribers, regardless of specialty.¹⁹ To foster physician and prescriber engagement, obtain their feedback regarding expected responsibilities

in the medication reconciliation process, as well as current workflow challenges. This can also assist in planning for changes in medication reconciliation procedures, especially the development of electronic processes. Consider enlisting the support of the pharmacy and therapeutics committee and medical executive committee in assisting prescribers to accept their responsibility for the performance of medication reconciliation in all types of care areas. True reconciliation includes the prescriber making a clinical judgment as to whether all medications on the list should be continued at the time of admission or change in level of care, held until further evaluation or for diagnostic testing, or discontinued.

- Both pharmacists and pharmacy technicians can play important roles in medication reconciliation as well. The pharmacy staff can participate in collecting and confirming essential patient information (e.g., allergies and reactions, complete medication history) with patients directly. Also, pharmacy staff can provide a valuable independent double check of the reconciliation of medication orders conducted when the patient's level of care changes (e.g., upon transfer, postoperatively, prior to discharge).

Address Design of Electronic Health Record Systems

- According to the Institute of Medicine,²⁰ interoperable medication data and provision of such data electronically can facilitate medication reconciliation. For facilities currently using a paper-based system for medication reconciliation, or a combination of both electronic and paper-based systems,²¹ consider transitioning to the use of a completely electronic reconciliation process through an electronic health record

(EHR) system. Ensure that the process includes a single electronic listing for all practitioners to utilize and eliminates documentation on multiple assessment tools.¹³ Include all elements of a complete medication order (e.g., drug, dose, strength, frequency), and designate these as mandatory data entry fields. Explore options to provide physicians with the ability to utilize an electronic list of current medications for discharge reconciliation procedures, as well as the ability to automatically populate a patient discharge instruction sheet once the reconciliation process is complete. Require periodic testing and assessment of the EHR system and medication reconciliation application to identify and address any performance or safety issues.

- EHR systems that are integrated with computer systems in outpatient clinics and physician office practices can provide prescribers and other healthcare practitioners the opportunity to view the medications a patient was prescribed upon discharge. This can better enable the practitioner to perform medication reconciliation in the outpatient setting by comparing what the patient is taking at the time of the office visit with what was prescribed upon discharge.²⁰
- Design discharge instructions to clearly display the drug name, dose, and administration instructions.¹⁰ For example, for insulin products, make sure the wording is congruent with how medications will be administered (e.g., 10 units) rather than how they are supplied (e.g., 100 units/mL).²²

Encourage Patient and Caregiver Involvement

- Educate patients and their families or caregivers on medication

reconciliation and the important role they play in the process.¹³

- Collecting a medication history is often dependent on patient recall. When a patient is on five or more medications, the likelihood of accurate recall of a medication name, strength, dose, frequency, route of administration, and indication drops significantly.^{5,23} Provide electronic access to a blank copy of the medical center's admission medication reconciliation form or a wallet card to assist patients in providing a complete medication history. Alternatively, provide a link to the universal medication form available from the Authority's website at <http://patientsafetyauthority.org/NewsAndInformation/Brochures/Documents/Universal%20Medication%20Form.pdf>.
- Encourage practitioners to involve patients when prescribing new medication orders and prior to medication administration. A simple statement like "Mr. Jones, I am going to give you your home blood pressure medications, lisinopril and Norvasc" or "Mrs. Jones, why do you take lisinopril?" during administration may help to identify any discrepancies that were missed and minimize the potential for medication error.
- Involve patients by planning for and implementing an aggressive public education campaign specifically designed around medication safety and medication reconciliation.¹⁸ Healthcare facilities may consider advertising initiatives through articles in the local newspaper, speakers at community forums, and the organization's community outreach programs.

Measure Medication Reconciliation Processes

- Ensuring that the medication reconciliation process is successful and results in clinically meaningful outcomes requires the development and use of specific metrics.¹⁸ For example, facilities can develop specific process measures (e.g., total number of admission reconciliations completed and documented within a designated time frame over the total number of admissions [new patients] in 24 hours) to monitor the success of medication reconciliation. It is also important to identify any near-miss events (and actual events) from the voluntary reporting program or other sources that can be prevented by an effective medication reconciliation process. Use this information to educate professional staff on the safety importance of implementing a successful reconciliation program.

CONCLUSION

Completing accurate medication reconciliation is important to ensure safe and effective medication use. Having a complete medication history allows clinicians to compare it with the patient's current and newly ordered medications to identify discrepancies and minimize potential adverse drug events. However, breakdowns in the admission, transfer, or discharge medication reconciliation do occur and introduce potential risk to the patient. Implementing strategies to limit these breakdowns and increase the accuracy of the medication histories obtained and reconciled can help foster smooth and safe transitions from one level of care to the next.



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LEARNING OBJECTIVES

- Recognize the most frequently reported event types involved in breakdowns of the medication reconciliation process.
- Identify causes and factors contributing to breakdowns of the medication reconciliation process.
- Distinguish between effective and ineffective strategies to reduce the risk of errors occurring during the medication reconciliation process.

SELF-ASSESSMENT QUESTIONS

The following questions about this article may be useful for internal education and assessment. You may use the following examples or come up with your own questions.

1. Which of the following was the most frequently reported type of event associated with breakdowns in the medication reconciliation process?
 - a. Additional drug or dose
 - b. Drug omission
 - c. Wrong dose
 - d. Wrong drug
 - e. Wrong patient
2. An omitted or missed dose may contribute to therapeutic failure and deterioration of the patient's condition. Which of the following was a leading factor in drug omissions related to medication reconciliation?
 - a. The medication reconciliation documentation was not communicated or transmitted to the pharmacy department.
 - b. Breakdowns occurred when patients were transferred between units within a hospital.
 - c. Prescribers indicated on medication reconciliation forms to "hold" doses of medications.
 - d. A medication list for a different patient was used during medication reconciliation.
 - e. The accuracy of information used during medication reconciliation was questionable.
3. Strategies to standardize the workflow processes involved in medication reconciliation and improve the completeness and accuracy of a patient's medication history include all of the following *except*:
 - a. Design the checklist to remind the practitioner to also ask the patient about non-oral and non-parenteral medications.
 - b. Assign responsibility to nursing and pharmacy for the medication reconciliation process.
 - c. Standardize patient identification processes such that all staff, including prescribers, nurses, and pharmacists, use and verify two reliable patient identifiers.
 - d. Enlist the support of the pharmacy and therapeutics committee and medical executive committee in assisting prescribers to accept their responsibility for the performance of medication reconciliation in all types of care areas.
 - e. Work to eliminate documentation of medication reconciliation information on multiple assessment tools.

Question 4 refers to the following case:

A patient with confusion was transported to the emergency department from a personal care facility. Two medication lists were sent with the patient—one for the patient and one for a different patient at the facility. When medication reconciliation was completed, the two patients' medication lists were combined to compile a single medication list for admission. The physician reviewed the compiled list and ordered medications based on the list. As a result, the patient received multiple doses of the following medications from the other patient's list during the admission: zolpidem, QUetiapine, citalopram, gabapentin, oxyCODONE, and ALPRAZolam. During the admission, the patient was noted to be progressively more lethargic. The rapid response team was called. The patient was treated and remained on the unit. Later in the admission, following

**SELF-ASSESSMENT QUESTIONS (CONTINUED)**

a procedure, the patient was transferred to the intensive care unit due to inability to fully wake up following sedation. Medications were adjusted. The remainder of the hospital course was uneventful. Upon preparation for discharge, information about the patient's hospital stay and medications was communicated to the personal care facility. The facility questioned some of the medications and indications, revealing the medication errors that occurred upon admission. The patient was discharged back to facility in stable condition.

4. Which of the following is the appropriate strategy that would most directly prevent this event from reoccurring?
 - a. Clearly define the roles and responsibilities of staff involved in the medication reconciliation process.
 - b. Request pharmacy to confirm and verify essential patient information with the patient directly.
 - c. Instruct nurses collecting medication history information during medication reconciliation to adhere to the "five rights."
 - d. Standardize the verification of the patient identity recorded on documentation sent from outside facilities in the medication reconciliation process.
 - e. Stress to all staff, including prescribers, nurses, and pharmacists, the importance of following the standardized process to reduce the risk of medication errors and patient harm.

Question 5 refers to the following case:

A patient was admitted to the general rehabilitation unit. The admission orders included an order for Lantus® (insulin glargine) 100 units daily and 100 units at bedtime. During acute care admission, the patient had been receiving 35 units daily and 25 units at bedtime. I spoke with admitting resident to change the Lantus dose back to previous dosing. Per the admitting resident, the patient's discharge instructions stated dose as 100 units. Upon review of the discharge instructions, the medication appears as follows: "Medication Name/Strength column: Insulin Glargine (Lantus) (Insulin Glargine 100 units/mL Subcutaneous Solution)" and the "How much do I take?" field is blank.

5. Which of the following strategies would be most effective in reducing the risk of this wrong-dose event?
 - a. Design discharge instructions to clearly display the dose such that the wording is congruent with how the medication is to be administered rather than how it is supplied.
 - b. Encourage practitioners to involve patients when prescribing new medication orders and prior to medication administration.
 - c. Differentiate the names and package designs of insulin products to reduce look-alike and sound-alike confusion.
 - d. Identify near-miss and actual events, and use them to educate staff on the importance of following the standardized medication reconciliation process.
 - e. Develop standardized clinical guidelines on how to prescribe insulin.

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