Medication Errors in Long-Term Care: Part 1

The consultant pharmacist has a vital role in the management of medications in the long-term care setting, but this activity is retrospective, and it may uncover medication errors that have already occurred. However, this process does not prevent medication errors from occurring. When medication errors arise in the ambulatory and long-term care settings, the mistakes often are not caught for many days—or weeks—after the event occurred. The errors are the result of a wide range of causes. The Institute for Safe Medication Practices (ISMP), a nonprofit organization whose goal is to prevent medication errors, promotes safe medication use and gathers information in drug errors.

For example, ISMP received a report from a long-term care pharmacy that received a faxed copy of a doctor’s order (Figure 1). The result: the pharmacy dispensed Coumadin (warfarin) 1 mg HS (at bedtime), an anticoagulant instead of Cardura, for hypertension. Subsequently, the patient received 20 days of Coumadin instead of Cardura before the error was discovered during the patient’s hospitalization for uncontrolled hypertension.

Understanding the Causes of Errors

To truly understand the underlying reasons or root causes contributing to medication errors, we must first understand the medication-use system in the long-term care setting. This system is a complex group of related processes: medication pre-
scribing; prescription processing, dispensing, and delivery to the facility; staff and patient education; medication administration; and medication monitoring.

Medication errors are a property of this system as a whole, rather than purely the result of the acts or omissions of the people involved with the system. Even when an error can be traced to an individual, further investigation is likely to determine that a variety of contributing factors led to that individual’s perceived failure. Some of these factors include poor communication of orders among the physician, nurse, and pharmacist; dangerous medication storage practices; or look-alike packaging and labeling.

Unfortunately, when analyzing errors, organizations tend to focus only on those at the active or “sharp end” of the error—the frontline practitioner most directly associated with it such as the pharmacist who


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What Is ISMP?

The Institute for Safe Medication Practices (ISMP) is a nonprofit health care agency comprising pharmacists, nurses, and physicians. It was founded in 1994 to learn about—and prevent—medication errors, especially the system-based causes of these errors. The organization disseminates practical recommendations for health care providers, consumers, and the pharmaceutical industry.

A key element of its medication error-prevention efforts is a voluntary practitioner error-reporting program, helping the organization to learn about errors happening across the country, understand their causes, and share “lessons learned” with others in the health care community. Each year, its national Medication Errors Reporting Program, operated by the United States Pharmacopeia in cooperation with ISMP, receives hundreds of confidential error reports from health care professionals. ISMP publishes newsletters and other documents for both health professionals and consumers, and it conducts on-site risk assessments in health care facilities. ISMP also works directly and confidentially with the pharmaceutical industry to prevent errors that stem from confusing or misleading naming, labeling, packaging, and device design.

dispensed or the nurse who administered the medication. Some health care practitioners are taught early in their careers that they must always be perfect, an unattainable and unrealistic expectation for any human. And when errors occur, our inclination is to blame individuals.

To make matters worse, these individuals may be unjustly labeled as inattentive, incompetent, lazy, and uncaring, and subjected to punitive actions, private reprimands, remedial education, or termination. It’s not surprising, then, that these individuals may be tempted to cover up any future errors. In the end, these disciplinary actions do little, if anything, to prevent errors from happening again within the organization. It does nothing in the way of focusing attention on the most manageable component of an error: the system itself.

Effective analysis (“root cause analysis”) considers the contributing factors or latent failures causing an error. Latent failures are weaknesses in organizational structures that support the medication process. They often are subtle and may not appear to directly cause an error. Examples of latent failures can be found in Table 1. Their consequences are hidden, becoming apparent only when they occur together and in combination with failures or “slips” made by individuals at the “sharp end.”

If we want to improve medication safety, we must focus on redesigning the system that led individuals down the medication error path, before...
errors occur. Over the years, ISMP has gained a great deal of insight into the medication-use system through reports of medication errors and by performing on-site analyses of the medication-use process at various health care organizations. It also has identified weaknesses that are common to many organizations. This systems-based philosophy forms the foundation of ISMP’s approach to preventing medication errors.4

The contributing factors involved in medication errors can generally be grouped into broad categories that we refer to as our “key elements” of the medication system. The interrelationships among these elements form the structure of many of ISMP’s recommendations for preventing medication errors. This article presents an overview of some of the characteristics in each key element. Part 2 will list examples of the types of errors that can occur because of breakdowns in the system and how to prevent them. Consultant pharmacists need to help long-term care organizations identify these breakdowns in the medication-use process by incorporating a “potential medication error” review along with the monthly chart-review process.

Table 1. Examples of Latent Failures

- Incomplete information about a patient
- Unclear communication of a drug order
- Lack of independent check before dispensing or administering medications
- Lack of computer warnings (interactions, allergies, dosages, etc.)
- Ambiguous drug references
- Drug storage (look-alike, sound-alike medications; hazardous chemicals)
- Unclear policies/procedures
- Lack of staff education

What’s Needed to Help Avoid Potential Errors

Patient Information
Information about the patient guides the appropriate selection of medications, doses, and routes of administration. Critical patient information must be available to health care practitioners before prescribing, dispensing, or administering medications. Such information would include:
- Patient age
- Complete drug history: prescription and over-the-counter, medications, vitamins, herbal products, dietary supplements, and alternative medications
- Pertinent social history, e.g., smoking, alcohol intake
- Diagnoses
- Allergies

Studies have shown that as many as 18% of serious, preventable adverse drug events stem from practitioners having insufficient information about the patient.
- Height and weight
- Lab values, e.g., blood glucose or cholesterol levels, blood pressure, hepatic or renal function

However, being able to access all of this information is not always possible. Studies have shown that as many as 18% of serious, preventable adverse drug events (ADEs) stem from practitioners having insufficient information about the patient before prescribing, dispensing, or administering medications. Twenty-nine percent of prescribing errors alone are directly associated with having inadequate patient information, most notably information about allergies, renal and hepatic function, and pregnancy status. Even if prescribers have this necessary information, pharmacists and nurses may not. When medications are dispensed or administered without access to the patient information, a critical system of double checks has been bypassed, and errors in prescribing may go undetected. Access to essential patient information at the time of medication prescribing, dispensing, and administration will significantly decrease ADEs.

However, in the absence of sharing information, preferably electronically, with others, consultant pharmacists must identify effective ways to obtain and communicate pertinent clinical data. For example, when performing monthly chart reviews, consultant pharmacists should check to see that the patient’s allergies are documented in all areas where medication information is documented—physician’s and nurse’s progress notes, physician’s order sheets, and medication administration records—including those that are handwritten. Flow sheets should be developed on an easily accessible form to help monitor and document critical lab values such as blood-glucose levels and INR, which are monitored routinely.

According to the Fleetwood Project Phase II, research funded by the American Society of Consultant Pharmacists (ASCP) Foundation, the consultant pharmacist should consider performing patient assessments, at least for those patients admitted to the facility who are considered to be at high risk or are on high-alert medications.

Finally, errors have occurred when the information on the physician’s order sheet, which appears on a resident’s transfer order form, is misinterpreted. For example, a report submitted to ISMP involved a resident who was transferred from a hospital to a nursing home. A handwritten hospital transfer order was written for Tiazac 240 mg, which is used for hypertension (Figure 2).

At the nursing home, the order was transcribed as Tigan 240 mg, used for nausea and vomiting, by the nursing staff. Because Tigan is not available as 240 mg, a pharmacist called the nursing home physician to clarify the order. The physician changed the order to 250 mg. Not only did the patient receive the wrong (and inappropriate) medication for 11 days, but the patient did not receive his high blood pressure medication as well.

As a part of the drug regimen review process, consultant pharmacists should review the transfer-order sheets to identify any errors that may have occurred when copying information from the transfer orders to the physician’s orders in the chart.

Drug Information
More than one-third (35%) of all preventable ADEs are directly related to inadequate dissemination of drug information. Overall, knowledge deficits about drug therapy were the most common cause of medication errors during drug prescribing and administration, and dosing errors are the most frequent type of error. Accurate drug information must be readily accessible to all practitioners through a variety of sources including drug reference texts, electronic software programs, a drug information center, and the Internet.

Medication texts are updated for two primary reasons—new information becomes available, and errors in previous editions, if identified, are corrected. One example of an error that appeared in a drug reference that could have led to significant harm involved the 2002 Mosby’s Nursing Drug Reference, which inadvertently switched the pharmacokinetic information on two products in the monograph for insulin aspart
(Novolog) and insulin glargine (Lantus). Lantus was listed as having a rapid onset of action and short duration, while Novolog is listed as having a 24-hour duration. 9

Consultant pharmacists serve as a vital source of drug information on these and other issues, and they should be readily available to prescribers as well as nursing staff to answer questions related to medication therapy. Consultants should scour nursing units in facilities for outdated texts and other reference materials such as “Do not crush” lists and remove them from use and/or replace them with the newest edition. Electronic software programs should be available to the pharmacy provider as well as the long-term care facility and must be updated on a scheduled basis. Pharmacy order-entry systems should screen for food and drug interactions, allergies, dose limits, and duplication of therapy, and these features should be tested for this capability.

Alarming findings from a 1999 field test by ISMP found that pharmacy computer systems in this country were vastly unreliable when used to detect and correct prescription errors or pharmacy order-entry errors. Six years later, another field test by ISMP confirms the conclusion: only 4 of the 182 systems tested in health care organizations in 2005 were able to detect all the unsafe orders presented in the test. 10

**Communication of Drug Orders and Other Drug Information**

Miscommunication among physicians, pharmacists, nurses, and patients is a common source of medication errors. Failure to control and standardize prescribing vocabulary often leads to inappropriate use of dangerous abbreviations, acronyms, coined names, and other ambiguous methods of communicating drug information. Studies have identified that more than 1 in 10 medication errors are directly related to the use of incorrect drug names, confusing expressions of dosage forms, and misunderstood abbreviations.

**Figure 2. Tigan Misread as Tiazac**

![Image of handwritten prescription]

*Studies have identified that more than 1 in 10 medication errors are directly related to the use of incorrect drug names, confusing expressions of dosage forms, and misunderstood abbreviations.*
lead to misinterpretation of prescriptions. Consultant pharmacists need to establish and help enforce safe ordering guidelines and provide a list of dangerous abbreviations or dangerous methods of expressing drug information to prescribers, nursing home staff, and dispensing pharmacies.

One of the most common medication errors occurs when two drug names that look similar are confused. Human factors experts tell us that “confirmation bias,” something we all experience from time to time, plays a role. Confirmation bias means that you are more likely to believe information that supports your view rather than information that does not. Another way of putting it is that you are more likely to see what you are most familiar with, not what’s really there.

One report sent to ISMP involves a case of confirmation bias in a long-term care pharmacy where both orders were misinterpreted and dispensed to the patient (Figure 3). The first error occurred when the top order for Cardura (doxazosin) was misread as Coumadin (warfarin). Then, to make matters worse, the bottom order for Avandia (rosiglitazone), prescribed for diabetes, was also misread as Coumadin. As a result, the patient received 4 mg of Coumadin in the morning and 2 mg at bedtime.11

When reviewing patients’ charts, pharmacists should check all new orders not only for appropriateness of therapy, but also to identify actual or potential errors that may have occurred as a result of look-alike names, dangerous abbreviations, or other ambiguous orders. Then, these orders should be compared with the most recent printed physician’s order sheets.

Verbal orders offer more room for error than orders that are written or sent electronically. The interpretation of what someone else says is inherently problematic because of different accents, dialects, and pronunciations. Background noise, interruptions, and unfamiliar terminology often compound the problem. Once received, verbal orders must be transcribed as a written order, which adds complexity and risk to the ordering process. The only real record of the verbal order is in the memories of those involved.

When the recipient records a verbal order, the prescriber assumes that the recipient understood correctly. No one except the prescriber, however, can verify that the recipient heard the message correctly. If a nurse receives a verbal order and subsequently calls it to the pharmacy, there is even more room for error. In addition, the Fleetwood Project Phase II demonstrated that, when allowed by law, interventions will be more effective if the pharmacist communicates directly with the physician, rather than through a nurse, to discuss the pharmacist’s recommendations and to resolve actual or potential medication-related problems.

The Fleetwood research also found that physicians were more likely to accept the pharmacist’s recommendations if they were made before therapy was initiated.7

The pharmacist must rely on the accuracy of the nurse’s written transcription of the order and the pronunciation when it is read to the pharmacist. Sound-alike drug names also impact the accuracy of verbal orders. There are literally thousands of name pairs that can easily be misheard. We have received error reports where verbal orders for “Celebrex 100 mg PO”, a COX-2 inhibitor anti-inflammatory, were misheard as “Cerebyx 100 mg PO, an anticonvulsant.” Drug names are not the only words prone to misinterpretation—numbers are also easily misheard.

For example, a physician called in an order for “15 mg” of hydralazine to be given intravenously (IV) every two hours. The nurse, thinking that he had said “50 mg,” administered an overdose to the patient who developed tachycardia and had a significant drop in blood pressure.12 The recipient of the verbal orders should always read the order back to the prescriber to avoid misinterpretation.

This step, which is a requirement for those long-term care facilities accredited by The Joint Commission (previously the Joint Commission on Accreditation of Healthcare Organizations), is essential and should become a habit, even if the recipient is confident that he or she
has heard the order correctly. When the prescriber is not calling the pharmacy directly, reading back the order should happen twice—first, for verbal orders between the physician and nursing home and later for telephone orders between the nursing home personnel and the pharmacy staff member. While reviewing a patient’s charts on the nursing units, consultant pharmacists should observe this process to ensure that nursing personnel follow through with the read-back procedure. Encourage both prescribers and recipients of verbal orders to provide or obtain the purpose of the prescribed medication to ensure that the order makes sense in the context of the patient’s condition. Most reported sound-alike name pairs have different indications.

Medication orders routinely are communicated to dispensing pharmacies using fax machines. This process is open to a variety of errors when these orders do not come through to the pharmacy in a clear fashion. A report sent to ISMP tells of a long-term care pharmacy that sent to the nursing home physician orders with an order for “Gabapentin 300 mg Neurontin 2 caps = 600 mg tid” (three times a day). The pharmacy received a fax copy of the order sheet, and on this copy it looked like the provider changed the order to “300 mg one tab qid” (four times a day).

When the pharmacy later received a pharmacy back copy, the provider had clearly changed the order to “800 mg 1 tab QID.” The fax had been cut off on the left side to make the order, making the “8” look like a “3” and the order to appear as “300 mg 1 tab qid.” Unfortunately, long-term care pharmacies receive the original prescription for comparison long after the processing of the original faxed prescription. In addition, a study found that prescriptions received by fax required a greater number of clarification calls than those received by other methods of communication.13

Only 4 of the 182 pharmacy computer systems tested in health care organizations in 2005 were able to detect all the unsafe orders presented.

Figure 3. Cardura and Avandia Confused with Coumadin

1 Drug Labeling, Packaging, and Nomenclature

Look-alike or sound-alike drug names, as well as ambiguous and confusing packaging and labeling, significantly contribute to medication errors. In fact, a frequent (29%) cause of pharmacy drug-dispensing errors is failure to accurately identify drugs, usually because of
look-alike or sound-alike drug names.

Additionally, 10% of all nursing drug-administration errors are the result of faulty drug identification, also from look-alike and sound-alike drugs. Often, products with look-alike names also have similar package labeling, which compounds the problem, especially since many of these products are stored near or next to each other in the pharmacy and in the long-term care facility emergency boxes, floor stock, medication rooms, and medication carts.

Commonly confused medications that fit this scenario include:
- chlorPROMAZINE and chlorPROPAMIDE
- hydroALAZINE and hydroOXYZINE
- morphine and HYDROmorphine
- traZODONE and traMADOL
- HYDROcodone and OXYcodone
- LORAzepam and ALPRAzolam

Insulin products such as:
- HumaLOG and HumuLIN
- NovoLOG and NovoLIN
- HUMulin and NOVolin
- HumaLOG and NovoLOG
- NovoLIN 70/30 and NovoLOG Mix 70/30

Look-alike packaging especially has implications with the elderly who do not reside in a skilled facility and who have to take their medications with little or no guidance. For example, a patient was admitted to a hospital for an orthopedic problem with a medical history that included glaucoma and diabetes. The pharmacy received several medication orders for his glaucoma and diabetes including one for “Glucose Control Solution one drop to left eye twice daily” written by the orthopedic physician assistant. When the pharmacist questioned the prescriber she was told, “That’s what the patient says he uses,” so the pharmacist asked the patient who, indeed, confirmed that he was instilling the drops in his eye per his eye doctor’s instructions.

When the eye doctor was contacted it was determined that the correct medication was supposed to be timolol 0.5%. Both products, Glucose Control Solution by Precision and generic, as well as brand-name timolol ophthalmic solution, are small drop bottles with yellow caps and small black lettering. This elderly diabetic patient with poor eyesight confused the timolol with the Glucose Control Solution (Figure 4). Unlabeled medications, such as syringes with insulin or oral medications that are prepoured into soufflé cups prior to administration, have often been mistaken as a different drug or given to the wrong patient, which have led to serious events as well.

Drug Standardization, Storage, and Distribution

Medications and drug supplies must be stored and dispensed in a manner that reduces the likelihood of an error. This includes sample medications, high-alert medications such as anticoagulants, opioids, and oral hypoglycemic agents, and chemicals used in compounding, as well as nondrug supplies. We have received numerous error reports where isopropyl alcohol was mistaken for distilled water, and antibiotic suspensions were compounded and dispensed. Other issues in long-term care facilities include storage of discontinued or “on-hold” medications (which often encourage the borrowing of medications) and how to separate medications taken internally versus medications used externally.

To minimize errors related to nomenclature, labeling, and packaging, as well as the storage of medications, consultant pharmacists need to regularly review professional literature to identify error-prone drug products and share this information with both the dispensing pharmacy and the long-term care facilities before errors occur. Encourage dispensing pharmacists to build alerts in computer systems to remind pharmacists about problematic products, design computer mnemonics to decrease the likelihood that the drugs will appear on the computer screen simultaneously, and separate or clearly differentiate these products in the pharmacy.

In their routine monthly visits to nursing facilities, consultant pharmacists should incorporate a process to review labeling and storage practices, identify commonly confused drug names in each facility, and take steps to separate or clearly differenti-
ate those products that are stored in close proximity. Improper labeling of medications dispensed by the pharmacy can also contribute to errors.

Medications must be clearly labeled, free of dangerous abbreviations or dose expressions that may be misinterpreted, and include the appropriate auxiliary labels. Consider differentiating drug names or similar product labeling using stickers or labels that incorporate enhanced lettering techniques, such as upper-case lettering (i.e., chlorproMAZINE and chlorproPAMIDE). Consultants should review the medications that are stored in emergency boxes as well as first-dose boxes and floor stock, not only for expiration dates, but also to ensure that:

- Medications available are actually needed or used
- The variety of medications are minimized
- Drugs are stocked in unit-dose packaging in smallest dose and/or container size and available in a single concentration

**Use of Devices**

Health care practitioners should be competent in using and educating patients about the devices that are common to their practice. These drug-delivery devices, which also can be involved in medication errors, include syringes (oral and parenteral), inhalers, spacers, IV pumps, and tubing. Consultant pharmacists should provide initial and ongoing education that should include the proper use and preventive maintenance of any device that they are expected to use. This instruction should include a “return” demonstration to ensure that providers understand the proper use of any device that is dispensed with a medication or used to administer.

One story that occurred in a hospital, which exemplifies this, includes an order that was written

**Figure 4. Look-Alike Packaging Implications**

Miscommunication among physicians, pharmacists, nurses, and patients is a common source of medication errors.
for “TUSSIONEX suspension” (hydrocodone and chlorpheniramine), but the oral route of administration was not specified. The pharmacy dispensed the cough medicine in unit-dose oral syringes. However, the patient’s nurse had recently joined the staff after working in a long-term care facility and was unfamiliar with oral syringes. She made the assumption that, since the liquid was in a syringe and the patient had IV access, the drug should be given IV. Unfortunately, a pharmacy label covered the words, “For oral use only,” that the manufacturer had printed on the oral syringe. Noting that the drug was rather thick, she transferred it from the oral syringe into a regular syringe, diluted it with saline, and injected it. Afterwards, she commented to another nurse that the drug was quite sticky.

Further queries led to recognition that the drug had been given by an incorrect route. The IV site was immediately removed, the patient was monitored, and fortunately, no harm occurred. This scenario shows that not every nurse is familiar with oral syringes and some, as in this case, may mistake a liquid medication in an oral syringe for a parenteral product.\textsuperscript{15}

Conclusion
The consultant pharmacist has a vital role in the management of medications in the long-term care setting. Part 2 will conclude with a review of the key elements of the medication-use process, contributing factors that lead to medication errors, and recommendations for consultant pharmacists to assist long-term care facilities in preventing medication errors.\textsuperscript{16}

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