ISMP Medication Error Report Analysis

Selected Medication Safety Risks to Manage in 2016—Part I Intravenous Fat Emulsion Needs a Filter

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These medication errors have occurred in health care facilities at least once. They will happen again—perhaps where you work. Through education and alertness of personnel and procedural safeguards, they can be avoided. You should consider publishing accounts of errors in your newsletters and/or presenting them at your inservice training programs.

Your assistance is required to continue this feature. The reports described here were received through the Institute for Safe Medication Practices (ISMP) Medication Errors Reporting Program. Any reports published by ISMP will be anonymous. Comments are also invited; the writers' names will be published if desired. ISMP may be contacted at the address shown below. Errors, close calls, or hazardous conditions may be reported directly to ISMP through the ISMP Web site (www.ismp.org), by calling 800-FAIL-SAFE, or via e-mail at ismpinfo@ismp.org. ISMP guarantees the confidentiality and security of the information received and respects reporters' wishes as to the level of detail included in publications.

SELECTED MEDICATION SAFETY RISKS TO MANAGE IN 2016—PART I

It would be an incredibly arduous and nearly impossible task to list all the risks associated with medication use that could lead to harmful medication errors. This is often at the heart of not knowing where to start to improve medication safety and why people frequently resort to playing “whack-a-mole,” addressing risks only after they pop up and become visible after an adverse event. This is one reason we developed the concept of Targeted Medication Safety Best Practices for Hospitals (<http://ismp.org/tools/bestpractices/TMSBP-for-Hospitals.pdf>); it helps create a sharp lens through which to focus improvement efforts on a few best practices that we are confident will prevent patient harm. Even so, we thought it might be useful to describe selected medication safety risks that might otherwise fall off the radar screen unless an adverse event happens to draw attention to them. There is an overabundance of risks to choose from, but we thought these particular, serious risks might not garner attention without mention. We have selected one risk from each of 10 key elements of the

medication use system, since vulnerabilities in these system elements cause errors.

In Part I, we'll cover 5 of the key elements – management of patient information, drug information, how information is communicated to staff, how medications are labeled and packaged prior to administration, and how patients are educated. In Part II, we'll cover the remaining 5 elements associated with medication storage, the environment, medication devices and technology, human resources, and culture.

1. Patient Information: Placing Orders on the Wrong Patient's EHR

Now that most hospitals and doctors' offices have implemented electronic health records (EHRs), a potentially hidden vulnerability that can lead to serious errors is placing orders on the wrong patient's electronic record. Even if you are aware of this vulnerability, you may not realize how often errors occur. Using a unique retract-and-reorder tool, which identifies orders placed on a patient's electronic record that are then retracted and reordered on a different patient's electronic record, Adelman et al¹ were able

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to identify and quantify close calls that would have resulted in wrong-patient errors but may not have been reported as such. According to this study, about 14 wrong-patient electronic orders are placed every day in a large hospital system with approximately 1,500 beds, or about 68 wrong-patient errors per 100,000 medication orders.¹ By this measure, 1 in 37 hospitalized patients will have an order placed for them that was intended for another patient.¹

These errors—made not only by prescribers but also by pharmacists and nurses who enter orders—are sometimes due to juxtaposition, but more often they are caused by interruptions and having more than one patient's electronic record open. Interestingly, nurses have a lower rate of this type of error, whereas radiology and outpatient providers have higher error rates than their comparison groups.¹

Multiple studies have demonstrated ways to reduce these events. Requiring verification of the patient's identity (ID) has reduced errors by 16%¹ to 30%² and requiring reentry of the patient's ID has reduced errors by 41%.¹ Prompting clinicians for an indication when certain medications are ordered without an indication on the patient's problem list has intercepted errors at a rate of 0.25 per 1,000 alerts.³ In one study, most emergency department (ED) staff (81%) felt a room number watermark on the patient's electronic record would eliminate most wrong-patient orders in the ED.⁴

In another study, clinicians had confidence that the following interventions would significantly reduce wrong-patient entries: including a patient's photo on order entry screens, showing the patient's location based on a unit floor plan, providing alerts about similar names, using RFID (radio-frequency identification) technology, always showing the patient's full name on screens, requiring reentry of the patient's ID, and including the identity of the patient with the order submit button.⁵ Limiting the number of patient electronic records that can be opened at one time is also recommended; its ability to reduce errors is currently under study.

2. Drug Information: Nursing References That Promote Unnecessary Dilution of IV Push Medications

According to a 2014 ISMP survey on medication dilution practices, 83% of nurses reported that they sometimes further dilute adult intravenous (IV) push medications prior to administration.⁶ The medications most often diluted by nurses participating in the survey included opioids, antianxiety/antipsy-

chotic medications, antiemetics, anticonvulsants, cardiovascular medications, reversal agents, insulin, and heparin. A decision to dilute adult IV push medications is often made to avoid patient discomfort or extravasation of vesicants and/or to help administer the drug slowly. While dilution for these reasons may seem understandable (although often unnecessary), we were alarmed to learn that 43% of nurses further dilute the medications dispensed in manufacturers' prefilled syringes, which are largely intended for direct IV push administration. Furthermore, 20% of the nurses told us they also dilute medications dispensed in syringes prepared by pharmacy in patient-specific doses. These dilution practices may cause unnecessary risks, exposing the patient to potential errors, contamination, and infection.

Some of the drug references that nurses rely on suggest further dilution of many IV push medications that are not required based on the medication's package insert. These references suggest dilution may be warranted to ensure slow IV push rates of administration. You may want to look at your nursing drug references and conduct a nursing survey to learn the extent and variability of dilution practices within your organization. Once you understand when, how, and why nurses are diluting medications, take action to reduce unnecessary dilution and/or provide the products in different forms/strengths so nurses do not feel that they must dilute them. (Additional recommendations can be found at: www.ismp.org/sc?id=1656.) Also remind nurses that some drug references will suggest dilution as long as the official prescribing information does not specifically say to avoid it.

3. Communication About Drug Therapy: Confusing the Available Concentration as the Patient's Dose on Electronic Records

A longstanding risk that ISMP has warned about deals with how home medications appear on computer screens and how medication orders appear on electronic medication administration records (eMARs). If the available concentration of an oral or parenteral liquid medication precedes the patient's specific dose, the concentration has sometimes been mistaken as the patient's dose. For example, just a few months ago, a physician accidentally ordered 100 units of Lantus (insulin glargine) instead of the correct dose of 6 units every evening, because the list of home medications displayed the concentration right next to the drug name on the first line and the patient's dose below it on the second line: "Insulin

glargine (Lantus) 100 units/mL,” followed on the next line with “6 units subcutaneous daily every evening.”

Now that insulin is available in 100 units/mL, 200 units/mL, 300 units/mL, and 500 units/mL concentrations, the risk of receiving an overdose of insulin is high if the presentation of the order lists the product’s concentration before the patient’s dose. Physicians and nurses typically anticipate seeing the drug name and patient’s dose immediately beside it, while pharmacists may be accustomed to first viewing the available concentration to determine how best to dispense the patient-specific dose. However, our recommendation is to list the drug name, patient-specific dose, and directions for use on the first line of the eMAR and patient medication lists and the available concentration and any directions on how to measure the patient’s dose below it.

4a. Manufacturer Drug Labeling, Packaging, Nomenclature: Per Liter Electrolyte Content on Various Sizes of Manufacturers’ IV Bags

The way electrolyte concentrations are expressed on IV bags in volumes less than or greater than 1 L has tripped up many practitioners over the years. Concentrations are listed per liter, not per container volume. For example, a 250 mL 0.9% sodium chloride injection container label lists the sodium chloride content as 154 mEq/1,000 mL, rather than 38.5 mEq/250 mL. Commercially available parenteral nutrition (PN) products that are available in containers greater than 1 L also express the electrolyte ingredients “per liter.”

We recently described an error that occurred when a pharmacist was preparing a bag of 3% sodium chloride after the pharmacy unexpectedly ran out of the commercially available bags. The pharmacist mistakenly set the proportion up as $154 \text{ mEq}/0.9\% = x/3\%$ and calculated that he needed 513 mEq of sodium chloride, when he actually only needed 256-257 mEq of sodium chloride for a 500 mL bag ($77 \text{ mEq}/0.9\% = x/3\%$).

Clearly, it’s time for the US Food and Drug Administration (FDA) and the US Pharmacopeial Convention (USP) to rethink this electrolyte presentation with large volume parenterals (LVPs) in volumes less than or greater than 1 L. For single- and multiple-dose injectables, USP requires the strength per total volume as the primary, prominent display on the label, followed in close proximity by the strength per mL enclosed in parentheses. This should apply to LVPs as well. Until it does, pharmacists

who calculate electrolyte quantities should seek out an independent double check. Sufficient quantities of commercially available products should be used whenever possible. For products that routinely require admixture, an instruction sheet should be available to guide the process.

4b. Practitioner Drug Labeling, Packaging, Nomenclature: Drawing More Than One Dose into a Syringe

Hospitals need to address a potentially common practice whereby an entire vial of medication is drawn into a syringe in anticipation of additional doses of the medication being needed for the same patient, even though only a portion of the vial is needed for a single dose. Recently, a patient with pulmonary edema and possible pneumonia was about to be transferred from the ED to a medical intensive care unit when the patient’s condition began to deteriorate. According to press reports, doctors decided to intubate the patient and employ “mechanical ventilation as a result of respiratory distress/compromise.” Ketamine 100 mg was ordered, but the nurse drew up the total volume of 5 mL (500 mg) from a vial (100 mg/mL) of ketamine in case she needed additional incremental doses. She intended to administer just 1 mL (100 mg), but she inadvertently administered the entire 500 mg in the syringe. The patient arrested and could not be resuscitated.

The practice of withdrawing more than a single dose into a syringe was not supported in hospital policies. However, the nurse did not deviate from what was said to be a common at-risk behavior at the hospital (and no doubt in many other hospitals)—preparing a syringe containing an extra amount of a drug as a “just-in-case” measure if the physician wanted to order more drug later during the procedure. Similar practices often occur in postanesthesia care units, where small incremental doses of opioids are sometimes delivered, as nurses do not want to waste and document the witnessed disposal of opioids.

This tragic incident signals a need to identify whether this practice is occurring in your institution and to consider addressing circumstances where the practice should be prohibited. Otherwise, there’s an increased risk of patient harm from overdoses as well as possible contamination of the medication remaining in the syringe. Wherever possible, prefilled pharmacy-prepared or commercially available syringes that contain the exact dose should be used.

5. Patient Education: Discharging Patients Who Do Not Understand Their Discharge Medications

Despite the importance of teaching patients about the medications to take after discharge, studies suggest that health care providers are not successfully preparing patients for the transition home. Between 30% and 70% of patients make a medication error in the immediate weeks following hospitalization,⁷⁻¹¹ and the Centers for Medicare & Medicaid Services reports an average national hospital readmission rate of 17.5% to 19.5%.¹² The discharge process is often rushed and interrupted, making it difficult to ensure patients know what medications to take, the correct doses, and how to take them after discharge. Immediately prior to discharge is not an ideal time for education, as patients may be overwhelmed with the amount of information being provided at once. A recent study of patients with acute coronary syndrome or heart failure found that more than half of the hospitalized patients were either taking a previously prescribed medication that should have been discontinued (36%) or not taking a newly prescribed medication listed on the discharge medication list (27%).¹⁰ More than half (59%) of all discharged patients also misunderstood the indication, dose, or the frequency of use of the prescribed medications.¹⁰

Medication errors that occur during the first few weeks after discharge from the hospital can cause significant harm. In fact, one study showed that almost a quarter of all postdischarge errors were considered serious or life-threatening and that most of these errors happened within the first 14 days after discharge.¹¹ The highest predictors of postdischarge errors included low health literacy and low subjective numeracy (self-reported measure of the ability to perform mathematical tasks and the preference for numerical versus prose [words] information).¹⁰ Interestingly, numeracy was not specifically associated with misunderstandings in the numerical aspects of medications such as dose or frequency, but rather with taking a medication no longer prescribed, omitting a prescribed medication, or misunderstanding a medication's indication. No association was found between errors and educational attainment, the number of medications being taken, medications changed during hospitalization, poor social support, or low preadmission medication adherence. Perhaps this risk is best addressed with a redesigned discharge process that facilitates the most effective means of teaching patients about

their medications, initiating education earlier in the hospital stay, and providing postdischarge support.

Look for Part II in the next issue.

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IV FAT EMULSION NEEDS A FILTER

A change in the package insert for intravenous fat emulsions used in nutrition (eg, *Intralipid*,

Nutrilipid [*Liposyn III* from Hospira is currently out of stock]) indicates a 1.2 micron filter should be used when administering these products. This is also a change from some product labeling that stated filters are not recommended or if filtration is used, then a filter of less than 1.2 micron pore size must not be used. Newer fat emulsion labeling states: "Use a 1.2 micron filter with Intralipid (strength). Filters of less than 1.2 micron pore size must not be used."

There may be confusion about the change. For example, when Fresenius Kabi went from *Excel* to *Biofine* containers last year, the product label was simultaneously updated (June 2015) to reflect the new filter requirement. However, some package inserts sent along with information about the bag change did not yet have the label change. *Nutrilipid* has included wording about the need for filtration since 2014. Also, older labeling that says, "Use a 1.2 micron filter with admixtures ..." might mean only with a 3-in-1

admixture to some people. But the change is applicable to all fat emulsion infusions, admixture or not. Adding to the confusion, some products with older labels may still be in the supply chain, and Internet searches and drug information references may have outdated information.

A filter could stop fat emboli that might occur if the emulsion cracks and could also prevent particulate matter from reaching the circulation. Filters also reduce the potential for patient harm due to microprecipitates, microorganisms, and air emboli. Recently published American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) consensus recommendations [Ayers P, Adams S, Boullata J, et al. A.S.P.E.N. parenteral nutrition safety consensus recommendations. *J Parenter Enteral Nutr.* 2014;38(3):296-333] suggest using a 0.22 micron filter for dextrose/amino acids (2-in-1) admixtures and a 1.2 micron filter for total nutrient admixture (3-in-1) formulations. ■