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ISMP

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Educating the Healthcare Community About Safe Medication Practices

Selected medication safety risks to manage in 2016 that might otherwise fall off the radar screen—Part I

It would be an incredibly arduous and a near 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 wondering 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. It's also one of the primary reasons ISMP has established the *Targeted Medication Safety Best Practices for Hospitals*—to help create a sharp lens with which to focus improvement efforts on a few best practices that we are confident will prevent patient harm.

We introduced the *2016-2017 Targeted Best Practices* in our January 2016 newsletter (www.ismp.org/sc?id=1645). In this issue, we thought it would be useful to describe other selected medication safety risks that might otherwise fall off the radar screen unless an adverse event happens to draw attention to them. Again, there is an overabundance of risks to choose from, but we thought these particular, serious risks might not otherwise garner attention without mention. We have selected one risk from each of ISMP's 10 Key Elements of the Medication Use System™ (www.ismp.org/faq.asp#Question_3) as vulnerabilities in these system elements cause errors. In **Part I**, we cover five of the Key Elements related to the management of patient information and drug information, how information is communicated to staff, how information is presented on drug labels and packages, how healthcare providers package medications prior to administration, and how patients are educated. **Part II** will cover the remaining five Key Elements associated with medication storage, the environment, medication devices, staff education and competency verification, and culture.

1 KEY ELEMENT 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 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 al. were able to identify and quantify close calls that would have resulted in wrong-patient errors, but may never have been reported as such.[1] 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 most often caused by interruptions. Having more than one patient's electronic record open may increase the risk of error. Interestingly, nurses have a lower rate of this type of error, while radiology and outpatient providers have higher error rates than their comparison groups.[1]

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Pen device for U-500 insulin makes great sense. The US Food and Drug Administration (FDA) recently approved **HUMULIN R U-500 KWIKPEN** (insulin human injection) (500 units/mL) in a prefilled pen device. U-500 insulin is indicated for patients with type 1 and type 2 diabetes who need more than 200 units of insulin per day. The U-500 pen holds a 3 mL, 1,500 unit insulin cartridge and is the same size as other Lilly pens but dials in 5-unit increments rather than 1-unit increments (**Figure 1**). The device has an aqua pen body to differentiate it from other insulin pens. Until now, U-500 insulin was only available in a vial, and since there is no U-500 syringe, it had to be administered with either a U-100 insulin syringe that required a dose conversion to U-100 markings, or a tuberculin (TB) syringe that required conversion to volume markings.

Figure 1. New Humu**LIN** R U-500 KwikPen dials in 5-unit increments.

Most medication errors with Humu**LIN** R U-500 in vials have been due to dosing confusion when the dose was prescribed in units or volume corresponding to the U-100 syringe or TB syringe markings. It's important to mention that when switching to the new pen, dose conversions are no longer needed. Those familiar with the need for dose conversions when using a U-100 syringe may be confused. They need to be aware that the pen's dose window shows the number of units of Humu**LIN** R U-500 to be injected. The pen will then deliver the proper volume that corresponds to the dose. Again, NO dose conversion is required. However, keep in mind that patients using U-500 insulin from a vial at home will still communicate their

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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 noted 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 KEY ELEMENT 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/antipsychotic 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 hear 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.

We have found that some of the drug references relied on by nurses 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 don't feel 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 unnecessary dilution as long as the official prescribing information does not specifically say to avoid it.

3 KEY ELEMENT 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

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dose in U-100 unit markings or volume, so you will need to verify the dose and syringe or device used at home. You can find a brief video and more information about the new pen, which will be available in April, at: www.humulin.com/hcp-u-500.aspx. Note that the 20 mL vial of U-500 insulin will remain available, and the revised U-500 package insert includes the use of both U-500 vials and pens. Therefore, U-100 and TB syringe conversion tables are included, which may give rise to some confusion. These tables are NOT to be associated with the pen dosage form.

ISMP recommends that hospitals strongly consider using the U-500 pen as a way to eliminate dose conversion problems. This will assist nurses administering U-500 insulin to inpatients and makes sense for patients needing U-500 at home as well. Recently, we received an error report from a long-term care facility where the dose of U-500 was communicated as 20 units (a U-100 syringe had been used), when in fact the dose was actually 100 units. As with any insulin pen, steps should be taken to ensure that it remains "patient specific" and is never shared or used with another patient, even if the needle has been changed.

FentaNYL patch not adhering properly during use. A hospital pharmacist reported issues with transdermal fenta**NYL** patches from Actavis stating that the patches do not maintain contact with the patient's skin. This problem has affected two patients and involved three fenta**NYL** strengths. A patient with cancer-related pain had been wearing fenta**NYL** patches at home, prior to being admitted to the hospital. The patient was complaining of inadequate pain relief with the 100 mcg per hour patch. The nurse checked the patch and noticed a large bubble in the middle (**Figure 1**, on page 3) such that the area of the bubble was no longer touching the patient's skin. It had been 48 hours since the patch had been applied. A new patch was placed on the patient, but after 24 hours, the new patch was also not adhering to the patient's skin, and the patient's pain was not adequately controlled. No lotions, creams, or other substances

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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 KEY ELEMENT 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 liter 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 available in containers greater than 1 liter also express the electrolyte ingredients "per liter."

We recently described an error that occurred while 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 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 mEq/0.9% = x/3%). While nurses are not likely to make this type of mistake because they don't mix IV solutions, they still might misunderstand the total amount of electrolytes their patients are receiving due to the confusing labeling.

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 liter. 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 KEY ELEMENT 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 needing additional doses of the medication 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

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had been applied to the patient's skin prior to the patch being applied. However, the patient had recently started radiation (not at the site where the patch was applied), so it was thought that this might be affecting skin oils, causing the patches to not adhere to his skin. The patient was switched to extended-release oral pain medications, and his pain was controlled.

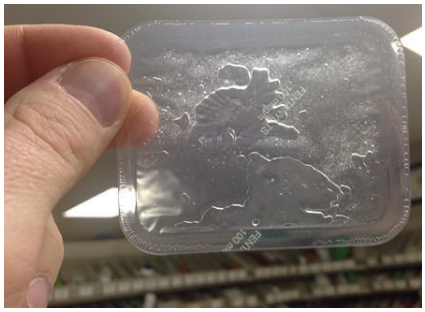

Figure 1. The hospital sent us this photo of one of the used Actavis fenta**NYL** patches.

Another patient at this hospital had the Actavis fenta**NYL** patch fall off after 24 hours. A new patch was applied but fell off again. A different brand was applied, and no additional problems occurred with this patient.

Lot numbers of the Actavis patches have been sent to the company and the US Food and Drug Administration (FDA). We don't know at this point if other lots are involved or the exact reason for the problem, so we've asked the company and FDA to investigate. An Actavis representative said the company has not had any recalls of the transdermal fenta**NYL** product. We think this problem and the resulting loss of pain control is important enough to mention, although further investigation is needed. We have only received a single report to date, so please report any similar experiences to FDA MedWatch (www.ismp.org/sc?id=1660) or ISMP (www.ismp.org/MERP) if you use Actavis fenta**NYL** patches so the scope of the problem can be estimated. Be sure to include the patch lot number(s).

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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 didn't deviate from what was said to actually 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 later order more drug during the procedure. Similar practices often occur in post-anesthesia care units, where small incremental doses of opioids are sometimes delivered, as nurses don't 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, with the thought of 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 KEY ELEMENT 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 healthcare providers are not successfully preparing patients for the transition home. Between 30-70% 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 17.5-19.5%.[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 post-discharge 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 post-discharge 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 post-discharge support.

Look for **Part II** in the next newsletter.

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