



Error-prone conditions that lead to student nurse-related errors

If your organization provides a site for student nurse clinical rotations, you are probably aware that students can be involved in medication errors despite close supervision by their clinical instructors. After analyzing errors involving student nurses reported to the USP-ISMP Medication Errors Reporting Program and the PA Patient Safety Reporting System, it appears that many of the errors arise from a distinct set of error-prone conditions or medications. Some student-related errors are similar in origin to those that seasoned healthcare professionals make, such as misinterpreting an abbreviation, misidentifying a drug due to a look-alike label, misprogramming an infusion pump, or simply making a mistake when distracted. Other errors stem from system and practice issues that are rather unique to environments where students and hospital staff care for patients together.

The duality of patient assignments is a prime example. Patients who are assigned to student nurses are also assigned to staff nurses. While dual assignments are necessary, communication breakdowns regarding who will administer medications to patients, what medications have been administered, and which medications should be held, have resulted in dose omissions and the administration of extra doses. Thus, communication between students, clinical instructors, and staff needs to be planned carefully to ensure a model that considers the safety issues associated with dual assignments.


Data from reporting programs also show that insulin is among the most frequent drugs involved in student nurse-related errors, particularly omitting prescribed doses, selecting the wrong type of insulin, administering the wrong sliding-scale insulin coverage, and administering insulin to the wrong patient. Student nurses may not make proportionately

more errors with insulin than staff nurses. However, like staff nurses, students and nursing instructors must treat insulin as a high-alert drug and observe targeted safeguards in place to prevent errors. This should include an independent double-check of all insulin doses by a staff nurse before administration. Additionally, organizations should share their list of high-alert drugs and associated error-reduction strategies with nursing instructors to ensure the same level of attention to safe practices occurs when students administer these drugs.

In Table 1 (page 3), we have listed additional error-prone conditions identified through analysis of student nurse-related errors. The list is not intended to be critical of student nurses or their instructors, nor is it intended to discourage organizations from providing a clinical rotation site for students. Student nurses often enrich the patient's experience, and they should be welcomed as part of the patient care team. Rather, the information in Table 1 should be used to stimulate system improvements to reduce the risk of medication errors.

Each practice site that hosts student nurses should meet with the clinical instructors who will be supervising students. The organization's medication administration procedures and specific error-prone conditions that may exist during clinical rotations should be reviewed, along with system-level safety nets and safety practices that have been designed to reduce these risks. Students and faculty should adopt these practices. In addition to the examples in Table 1, nursing instructors may be able to describe other error-prone conditions that they have observed, which can then be addressed. The instructors should also be invited to attend any orientation programs that cover the organization's safety goals so they can reinforce related safe practices during clinical rotations.

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 **Oral solution given IV.** An emergency department (ED) physician prescribed ondansetron 4 mg IV for a patient. When the nurse obtained the drug from an automated dispensing cabinet (ADC), she accidentally removed an oral syringe containing ondansetron oral solution (4 mg/5 mL). The oral solution had been added to the ADC for pediatric patients, several months after initially stocking the injectable product. The ADC screen had listed the injectable product first—*ondansetron 4 mg/2 mL injection*—and then the oral product—*ondansetron 4 mg/5 mL solution*. The latter entry did not specify that the product was an “oral” solution. Although the syringe with a non-parenteral tip was labeled “for oral use,” the nurse thought the drug was intended for injection, as it was clear like IV ondansetron. When she could not fit a needle on the end of the oral syringe, she withdrew the drug from the syringe using a parenteral syringe and needle. She then added the oral solution to an IV piggyback solution and administered the IV solution. She repeated this process for another ED patient. When she went to remove a third syringe from the ADC, the nurse discovered the mistake and notified the physician. Fortunately, the patients who received the oral medication intravenously suffered no adverse effects. The pharmacy now affixes an auxiliary label to all drugs dispensed in oral syringes that boldly states, “For oral use only,” as the warning on the oral syringe itself can easily be overlooked. “Oral solution” is also displayed on the ADC screen when appropriate, although ondansetron oral solution has been removed from the ADC, and pharmacy now dispenses the drug as needed. Any medication that seemingly needs to be

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Cross contamination with insulin pens

Facilities using insulin pens should bear in mind the possibility that a pen dispensed for one patient might be used for another patient. Recently, we heard from one nurse who told us that, rather than wait for a patient's pen to be dispensed from the pharmacy, nurses at her hospital often borrowed a pen from another patient, put on a new disposable needle, and injected a dose of insulin into the second patient. Apparently, the nurses failed to recognize that it's possible for biological contamination of the insulin solution to happen even if aspiration does not occur prior to injection.

It is unclear whether these nurses felt pressured to engage in this at-risk behavior because of system problems, such as lengthy turn-around time for delivery of new pen devices. But several studies suggest just how risky sharing pens among patients might be. In one study, hemoglobin was detected in 6 out of 146 cartridges (4.1%) used by diabetic patients (Sonoki K, et al. Regurgitation of blood into insulin cartridges in the pen-like injectors. *Diabetes Care* 2001; 24:603-04, available at: <http://care.diabetesjournals.org/cgi/content/full/24/3/603>). In another study of 120 patients, non-inert material, including squamous cells and other epithelial cells, was found in 58% of

the cartridges (Le Floch JP, et al. Biological material in needles and cartridges after insulin injection with a pen in diabetic patients. *Diabetes Care* 1998; 21:1502-04, available at: <http://care.diabetesjournals.org/cgi/rep rint/21/9/1502.pdf>). The authors noted that air bubbles could enter the cartridges after injection unless the needle is removed, suggesting that biological materials could do the same while the needle is in place.

Pen manufacturers caution users to remove the needle immediately after injection so as not to leave a channel for entry of air into the cartridge, and they also warn against sharing the device between patients. While we are not aware of any cases of actual cross contamination, the risk of transmitting infections shouldn't be discounted. Many hospitals have employed pen technology successfully and safely, but it's important to guard against possible failure points with these devices. For more information on potential problems with pen devices, including the use of one pen for multiple patients, see our February 2007 newsletter article, *PEN injectors: Technology not without imPENding risks* (www.ismp.org/Newsletters/nursing/Issues/NurseAdviseERR200702.pdf).

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moved from one syringe to another should signal a problem that requires further investigation and verification by another practitioner before use.



A TACTical error. A dermatologist who was consulted to evaluate a hospitalized patient with a skin disorder recommended "TAC 0.1%, apply TID to affected areas" in his consultant report. The patient's physician misinterpreted the recommendation as TAC (tetracaine/adrenalin/cocaine) and prescribed that medication for the patient. The pharmacist intervened and clarified the order with the prescribing dermatologist as triamcinolone cream 0.1%. A few months later, a hospitalized nursing home patient was referred to the same dermatologist for a rash unresponsive to hydrocortisone cream. This time, a different physician misinterpreted the dermatologist's "TAC" prescription as tacrolimus 0.1%, and again the wrong drug was prescribed. A clinical pharmacist recognized the problem and called the dermatologist, who again verified that the intended medication was triamcinolone 0.1%. To prevent misinterpretations, it's best to not accept any order in which the drug name is abbreviated; contact the prescriber to clarify the order and reinforce the dangers associated with the use of drug name abbreviations.

► Special Announcements

ISMP teleconference. Please join us for Part III in our series on high-alert medications, **Preventing errors with insulin: A multidisciplinary approach.** The teleconference, which will be held on **April 23** from 1:30 to 3:00 p.m. EDT, will explore current trends in insulin therapy, barriers to optimal safety, common types of errors with insulin, and error-reduction strategies. To register, visit: www.ismp.org/sc?k=tc37.

ADC guidelines. In 2007, ISMP held a national forum with pharmacists, nurses, and vendors to develop a set of safe practices for automated dispensing cabinets (ADCs). We thank McKesson, Omnicell, and Cardinal Health for their support of this project, and all who submitted comments on the draft guidelines. The final guidance document is now available at: www.ismp.org/Tools/guidelines/ADC_Guidelines_Final.pdf.

High-Alert Medications list. ISMP has updated its *List of High-Alert Medications* (available at: www.ismp.org). We added **opium tincture** to the list as well as a notation that colchicine injection will be removed from the list later in 2008 since the product is no longer manufactured. We plan to conduct a full survey again in 2009, but if you have any drugs you would like us to consider adding to the list before then, send a message to: ismpinfo@ismp.org.

Nurse survey. ISMP is investigating nurses' knowledge and attitudes about the medication-use process. Please go to www.nursingcenter.com/mederrors to complete a brief questionnaire to help us identify problems in practice that contribute to errors.

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Table 1. Conditions that Promote Student Nurse-Related Medication Errors

Error-Prone Conditions	Examples of Errors	Recommendations
<p>Nonstandard Times Medications scheduled for administration during nonstandard or less commonly used times, including early in the morning, are prone to student dose omissions.</p>	<ul style="list-style-type: none"> ■ A student omitted an antibiotic ordered as a one-time dose at 1100. ■ A patient did not receive his morning dose of insulin because the student assigned to the patient had not arrived on the unit in time to administer the drug. 	<ul style="list-style-type: none"> ■ Staff nurses should develop a proactive plan with students that clarifies the details and responsibility for administration of each ordered medication and how new medication orders received during the shift will be handled. ■ Staff nurses and nursing instructors should monitor patient's MARs and review potential omissions with students.
<p>Documentation Issues With both staff nurses and students administering medications to the same patients, dose omissions or extra doses have been administered because students or staff nurses have not properly documented drug administration or reviewed prior documentation of drug administration.</p>	<ul style="list-style-type: none"> ■ A student documented that he gave the patient his morning medications at 0830; these medications were still in the patient's drawer at 1700. ■ A student administered heparin to a patient and left the unit for a conference before documenting it; a staff nurse gave the patient another dose. ■ A student gave a dose of Lopressor to a post-op patient who had already received the medication in the PACU, which was documented on the PACU record. 	<ul style="list-style-type: none"> ■ Students and staff nurses should be using the same MAR. ■ Students and staff nurses should bring the patient's MAR to the bedside and document drug administration immediately after the patient has taken the medications. ■ Encourage students to review all sources of documented drug administration, particularly when patients are transferred from a different level of care or unit. ■ When possible, include students in verbal reports about their patients (e.g., PACU report upon transfer to the unit).
<p>MARs Unavailable or not Referenced Students may not consistently use the patient's MAR to guide the preparation of medications, and may not bring the patient's MAR consistently to the bedside for reference when administering medications.</p>	<ul style="list-style-type: none"> ■ A staff nurse had given a patient a dose of methadone at 0730; although this was documented, the student also gave the patient a dose at 0830. The student was using a worksheet she had created, not the MAR. ■ A student gave the wrong patient a dose of digoxin and warfarin; the student did not bring the MAR into the room to assist with patient verification. 	<ul style="list-style-type: none"> ■ MARs should be available to students when preparing and administering medications; worksheets should not be used. ■ Students should prepare medications using only the original MAR and should bring the MAR to the patient's bedside for verification before administering drugs. ■ Teach students the organization's process to identify patients using two unique identifiers before drug administration.
<p>Partial Drug Administration Students may not be administering all of the prescribed medications to assigned patients, particularly IV medications that they may not be permitted to administer.</p>	<ul style="list-style-type: none"> ■ A patient did not receive an IV antibiotic for 3 days; staff nurses were unaware that the students assigned to this patient were not allowed to give IV medications. ■ A student nurse did not administer a respiratory medication to her patient; she thought a respiratory therapist would administer it. 	<ul style="list-style-type: none"> ■ Nursing instructors should provide a daily report to each unit that hosts students regarding the types of medications that the students will and will not be administering. ■ Encourage students to confirm this information with the staff nurse assigned to their patient, and to report drugs that are not given when due.
<p>Held or Discontinued Medications Students have not known or understood the organization's processes for holding and discontinuing medications and have administered drugs that have been placed on hold or discontinued.</p>	<ul style="list-style-type: none"> ■ A student gave a dose of Lovenox that was noted to be held on the MAR. ■ A student did not know the meaning of a yellowed-out section on the MAR and gave the patient an IV dose of potassium chloride that had been discontinued. 	<ul style="list-style-type: none"> ■ The organization should review its procedures for holding medications and make any necessary revisions to ensure that the procedure is clear and reliable. ■ Share the organization's procedures for holding and discontinuing medications with nursing instructors and students.
<p>Monitoring Issues Students may not be aware that vital signs and/or lab values should be checked before administering certain medications.</p>	<ul style="list-style-type: none"> ■ A student gave a patient with an INR of 2.33 a dose of Lovenox, which was noted to be discontinued on the MAR when the INR reached 2 (patient was also on warfarin). ■ A student administered a dose of Epogen to a patient with a hemoglobin of 15.5; the dose was listed on the MAR to be held if the patient's hemoglobin exceeded 12. 	<ul style="list-style-type: none"> ■ Be sure students and nursing instructors know how to access the most recent lab results and are able to obtain them. ■ Work with students to help them identify vital signs and lab data that may alter medication therapy.
<p>Non-Specific Doses Dispensed Student nurses have administered excessive doses when they expected the drug to be provided in a patient-specific dose, but pharmacy had dispensed a larger dose or quantity.</p>	<ul style="list-style-type: none"> ■ A student gave the patient a 4 mg tablet of dexamethasone as dispensed, but 2 mg (½ tablet) had been prescribed. ■ A student administered the full amount of Dilantin suspension dispensed in a bottle intended to be used for several doses. 	<ul style="list-style-type: none"> ■ Pharmacy should dispense medications in ready-to-use, patient-specific doses whenever possible; otherwise provide further instructions on the MAR and the dose itself, if possible. ■ On MARs, list the patient-specific dose first (before the available dosage strength dispensed, if applicable), as in the following example: "Lopressor 25 mg," followed by "25 mg = ½ of a 50 mg tab."
<p>Oral Liquids in Parenteral Syringes Preparation of oral or enteral solutions in parenteral syringes has led to students accidentally administering these products by the IV route.</p>	<ul style="list-style-type: none"> ■ A student gave the patient an oral liquid dose of vancomycin by the IV route. ■ A student prepared an oral liquid narcotic in a parenteral syringe; while the instructor's back was to the patient, the student began to administer the drug via an IV saline lock. ■ A student gave a patient an oral liquid dose of furosemide IV, which was intended for gastric tube administration. 	<ul style="list-style-type: none"> ■ Pharmacists should dispense all oral liquid products in oral syringes. ■ Medication areas should be stocked with oral syringes. ■ Students should be advised that oral syringes must be used when preparing oral solutions and apprised of the dangers of not doing so. ■ Discontinue IV routes as soon as possible, if appropriate.
<p>Preparing Drugs for Multiple Patients Student nurses have given medications to the wrong patient, particularly when they prepared more than one patient's medications at a time and brought medications for two or more patients into a room.</p>	<ul style="list-style-type: none"> ■ A student gave the patient in bed A his medications along with a dose of warfarin 5 mg intended for the patient in bed B. ■ An instructor put medications intended for the patient in bed B on a table while observing a student administer medications to the patient in bed A; the student picked up the wrong medications and gave them to the patient. 	<ul style="list-style-type: none"> ■ Teach students by example to prepare one patient's medications at a time and administer those medications before preparing another patient's medications. Stress the risks associated with handling more than one patient's medications at a time. ■ Teach students the organization's process to identify patients using two unique identifiers before drug administration.