

Acute Care

ISMP Medication Safety Alert!®

Educating the Healthcare Community About Safe Medication Practices

Students have a key role in a culture of safety: Analysis of student-associated medication incidents



Undergraduate and postgraduate students in healthcare fields are attempting to develop the skills required to deliver safe and effective patient care as future practitioners. As part of their training, most students are exposed to a variety of practice environments and direct patient care experiences to help prepare them for their eventual careers. This hands-on experience places students in a position to be involved in medication errors or to catch and prevent errors before they reach patients.

More than a decade ago, ISMP published an analysis of medication errors involving student nurses that had been reported to the ISMP National Medication Errors Reporting Program (ISMP MERP) and the Pennsylvania Patient Safety Reporting System (PA-PSRS).¹ Based on that analysis, some student-related errors were similar in origin to those that seasoned licensed healthcare professionals make, such as misidentifying medications due to look-alike labels and packages, or making a mental slip when distracted. Other errors stemmed from system problems and practice issues that were unique to environments where students and hospital staff are simultaneously caring for patients. Staff and students assigned to the same patient is a prime example of how errors can happen. While dual assignments are necessary, communication breakdowns regarding who will administer the prescribed medications to patients, what medications have been administered, and which medications should be held, have resulted in dose omissions and extra doses.

Figure 1. Main themes and subthemes

CULTURE OF SAFETY ENABLERS

Identification, Resolution, and Reporting of Incidents by Students

- Verify medications, including independent double checks
- Dialogue with patients
- Apply recently-acquired therapeutic knowledge

CULTURE OF SAFETY CHALLENGES

Preceptor-Associated Challenges

- Availability for on-demand questions and regular check-ins
- Workload balance of clinical tasks and multi-student oversight
- Perpetuation of unsafe practices/workarounds

Gaps in Organizational Processes

- Timely and complete orientation, including key policies and procedures
- Definition of roles and responsibilities
- Requirements for clear documentation

In 2016, an analysis of healthcare student errors reported to the Pennsylvania Patient Safety Authority through PA-PSRS was published, which identified insulin, opioids, and anticoagulants as the most common high-alert medications involved in student-related errors, although less than 1% of the errors resulted in patient harm.² Most of the errors involved nursing students, during which an instructor or preceptor was involved or present approximately a quarter of the time. More than two-thirds of the

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SAFETY briefs



Entire bottle of nitroglycerin given, again! No, this is not a case from our old files, but a new case of administering an entire bottle (25 tablets) of sublingual nitroglycerin (**Figure 1**). During orientation, an inexperienced nurse administered the entire bottle to a patient, which was witnessed by another nurse who immediately removed the tablets from under the patient's tongue. Fortunately, the patient was not harmed.

This event was likely an unintended consequence of the 50-year-old “unit dose” safety initiative. The error usually occurs when a nurse consistently receives unit dose packages holding a single dose for patient administration. Unexpectedly, a very small vial or bottle of medication is dispensed that contains more than one dose, and an assumption is made that it must contain a single patient dose. We caution people to avoid placing multiple doses in one container, but sometimes that is not possible. Nitroglycerin tablets are one example.



Figure 1. Entire bottle of 25 nitroglycerin tablets was given to a patient.

Because of stability issues, nitroglycerin tablets must be dispensed in their original 25-count amber glass bottle and cannot be unit dosed. For charging purposes, order entry systems require a dispense quantity of 25 tablets even though the dose is just one tablet at a time. So, scanning the label will not cause an alert that the quantity in the bottle does not match the amount to be administered. In fact, when the nurse was asked why she administered 25 tablets, she stated that no alert was issued when scanning the bottle, so she thought the amount in the container was the correct dose.

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errors occurred during peak academic periods—February through April and September through November.

Earlier this year, a lack of Canadian literature describing the impact of healthcare students on medication safety prompted our sister organization, ISMP Canada, to analyze 616 student-associated medication incidents reported to three of its medication incident reporting databases and the Canadian National System for Incident Reporting (NSIR) between April 2013 and March 2017.³ The following describes the main themes identified in the analysis, along with examples illustrating the students' role in a culture of safety.

Qualitative Findings

Student-associated medication incidents involved multiple disciplines and occurred in a wide variety of healthcare settings. When examining the events from a culture of safety perspective, analysts identified both safety enablers and challenges (**Figure 1**, page 1). Within these two groups, there were three main themes, each with multiple subthemes.

CULTURE OF SAFETY ENABLERS

THEME: Identification, Resolution, and Reporting of Incidents by Students

Students were active in recognizing, resolving, and reporting medication incidents made by other members of the team. In 263 (43%) of the 616 reports, students identified and reported the error. The current practice of teaching medication safety principles to healthcare students supports a culture of safety, which may have provided a basis for students to identify and report incidents. Two key activities that enabled students to identify incidents were participation in medication verification and dialogue with patients.

Incident Example 1:

DEPO-MEDROL (methyl**PREDNIS**olone acetate) labeled "For IM, Intrasyovial and Soft Tissue Injection Only, Not for IV Use" was mistakenly dispensed instead of **SOLU-MEDROL** (methyl**PREDNIS**olone sodium succinate) intended for intravenous (IV) administration. Following the correct procedure for medication checks, a nursing student recognized the error and brought it to the preceptor's attention before it was given.

Incident Example 2:

A prescription for **VALTrex** (val**ACY**clovir) 500 mg twice daily for 6 days was received and processed at a community pharmacy. During patient counseling, a pharmacy student learned that the medication had been prescribed to treat a cold sore. The recommended regimen for this indication (Valtrex 2 g every 12 hours for 1 day) was suggested to, and accepted by, the prescriber.

PRACTICE TIP #1:

Students bring a new perspective to the medication-use system and should be encouraged to question, identify, and report errors/gaps.

CULTURE OF SAFETY CHALLENGES

THEME: Preceptor-Associated Challenges

The value of effective oversight and support from preceptors during students' rotations cannot be overstated. The availability of preceptors for both on-demand questions and regular check-ins is a critical component of a safe training environment. Factors contributing to inadequate oversight include high preceptor workload (e.g., preceptorship of multiple students, preceptorship of students in multiple locations, concurrent clinical demands) and lack of engagement on the part of the preceptor. Lack of preceptor oversight has previously been cited as a contributing factor associated with medication errors.⁴

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To help avoid this error, ensure the medication administration record (MAR) and automated dispensing cabinet (ADC) screens include instructions to administer just 1 tablet sublingually (with additional doses as prescribed), and consider placing a flag label on the glass bottle with this same information. Packaging the nitroglycerin vial in a plastic bag or plastic amber vial, and affixing a label listing the per tablet strength and notation to administer just 1 tablet per dose is also an option. Remind all practitioners when preparing or administering any medication, "If you need more than 3 (pills, vials, or other dosage form), call the pharmacy."



Video on safety culture. Cleveland Clinic Abu Dhabi has produced a medication safety video that depicts a medication error and touches upon the culture of safety. The video is freely available on YouTube at: www.ismp.org/ext/58.

NEW 2018-2019 ISMP Fellows

ISMP welcomes three new **ISMP Safe Medication Management Fellows**.

Samantha (Sammy) Burton, PharmD, just completed a Fellowship in the Basics of Medication Safety, Quality, and Informatics at MCPHS University/Saint Vincent Hospital in Worcester, MA. She received her Doctor of Pharmacy from Purdue University (Indiana). Her Fellowship is sponsored by Baxter International Inc.

Farzana Samad, PharmD, had recently been working as a clinical staff pharmacist at Baptist Hospital of Miami in Miami, FL. She received her Doctor of Pharmacy from Nova Southeastern University, College of Pharmacy (Florida). Her Fellowship is sponsored by Express Scripts Foundation.

Alexander (Alex) Shilman, PharmD, is an active duty US Army Officer who holds the rank of Lieutenant Colonel. He most recently served as the Chief of Pharmacy at the Army Medical Department Center and School & US Army Health Readiness Center of Excellence, Fort Sam Houston, TX. He received his Doctor of Pharmacy from the University of Toledo (Ohio). His Fellowship is supported by the US Army.

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Incident Example 3:

A nursing student contacted the instructor to observe measurement and administration of insulin. They realized that only a small amount of insulin remained in the vial, which was not enough for the patient's dose. The instructor asked the student to find another vial, then left to help other students. The instructor did not return. The student eventually had to ask other nursing staff for assistance, and the insulin was administered late.

PRACTICE TIP #2:

Be sure that the preceptor's workload accounts for the level of supervision each student needs to optimize his/her learning in a safe environment.

THEME: Gaps in Organizational Processes

Incident reports highlighted situations in which tasks were delegated to students before they were adequately oriented and prepared to perform them. Like other studies,^{1,2} error-prone processes such as simultaneous preparation of medications for multiple patients contributed to several of the incidents. Other reports described students not following organizational policies and procedures, noting that the students may not have been aware of them and/or staff may not have been following them to set a good example.

Incident Example 4:

A healthcare practitioner asked a medical student to retrieve a syringe of midazolam to administer IV in preparation for an epidural injection, while pointing to the supply area where the syringe was lying. The student handed the practitioner a syringe containing the neuromuscular blocking agent, rocuronium, instead. The drug was administered, and the patient became paralyzed and required intubation.

Incident Example 5:

In an outpatient pharmacy, a pharmacy student was asked to refill the metFORMIN bin in a robotic prescription dispensing system, a process which involved selecting and scanning the bottle label prior to pouring the tablets into the machine. With the aim of improving efficiency, the student picked up 4 bottles of medication but scanned the label of only 1 bottle 4 times instead of scanning each individually. The scanned bottle contained metFORMIN, but one of the other bottles selected contained acetaminophen with codeine tablets; both products were round, white tablets. As a result, two different medications were added to the same compartment of the robotic prescription dispensing system.

PRACTICE TIP #3:

Review organizational challenges impacting students at your facility to identify opportunities to improve the culture of safety.

Conclusion

The themes identified in this analysis illustrate the positive contribution students can make to medication safety, the importance of preceptor oversight, and the need for robust organizational processes that are followed by students and staff. While the inexperience of students has been described as a factor contributing to medication incidents,^{1,2} there are also positive aspects to having students in real-world healthcare settings. For example, they bring a unique perspective and question processes that could allow opportunities for error. Students can play a key role in a culture of safety if organizational processes and educational programs focus on optimizing that role. It is paramount that future practitioners are trained in environments that support safe medication use and that allow them to utilize their knowledge to reduce opportunities for errors.

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Your Reports at Work



Merck confirmed that it has updated the **BRIDION** (sugammadex) label to address two issues reported by you through the ISMP National Medication Errors Reporting Program (ISMP MERP). Previously, a peel-off label, meant for affixing to a syringe after dose preparation, listed the drug's 100 mg/mL concentration. This was sometimes incorrectly assumed to be the amount in the vial. Once the sticker was removed, the underlying vial label expressed the concentration as either 200 mg/2 mL or 500 mg/5 mL (**Figure 1**). The other issue being

addressed is that some versions of the label had a linear barcode that was printed horizontally around the circumference of the vial, making it difficult or impossible to scan (**Figure 2**). The updated label is shown in **Figure 3**. Thank you again for reporting these issues!



Figure 1. Older peel-off labels on 2 mL and 5 mL vials express the concentration per mL (top). Total vial content was only visible once the peel-off label was removed (bottom).



Figure 2. Older horizontal Bridion barcode was difficult or impossible to scan.

Figure 3. New Bridion label has a vertical barcode and peel-off label that no longer covers the label displaying the total amount of drug in the vial.

> **Student errors**—continued from page 3

References

- 1) ISMP. Error-prone conditions that lead to student nurse-related errors. *ISMP Medication Safety Alert!* 2007;12(21):1-2.
- 2) Hess L, Gaunt MJ, Grissinger M. Medication errors involving healthcare students. *Pa Patient Saf Advis.* 2016;13(1):18-23.
- 3) ISMP Canada. Students have a key role in a culture of safety: a multi-incident analysis of student-associated medication incidents. *ISMP Canada Safety Bulletin.* 2018;18(2):1-3.
- 4) Reid-Searl K, Moxham L, Happell B. Enhancing patient safety: the importance of direct supervision for avoiding medication errors and near misses by undergraduate nursing students. *Int J Nurs Pract.* 2010;16(3):225-32.

ISMP thanks ISMP Canada for sharing its analysis and report on this topic.³

Worth repeating...

Flushing IV tubing with unrecognized residual drug leads to adverse effects

Once again, we are reminded how residual drug in intravenous (IV) tubing can have severe effects if unrecognized when lines are flushed or other medications/infusions are administered through the same line, a subject we have covered in the past. We received a report about an elderly man hospitalized for prostate surgery. After the procedure, the patient complained of pain and was given **HYDRO**morphone IV in the post-anesthesia care unit (PACU). About a minute later, he developed slurred speech, body twitches, and a rapidly declining blood oxygen saturation level (SpO₂) before losing consciousness. The anesthesia care team was called, and two doses of naloxone were administered without effect. Realizing that during surgery the same line was used to administer rocuronium, the anesthesia care team administered 100 mg of sugammadex to reverse the effects of the residual drug in the IV port and tubing that the patient apparently received when the **HYDRO**morphone was administered. In less than a minute the patient regained consciousness and began to breathe spontaneously, with an SpO₂ of 93-95%.

If IV lines are not flushed, it is important to remember that the length of the IV tubing may contain 10 mL or more of uninfused medication. Additionally, needleless ports and stop-cocks also have dead space where the drug can accumulate.

In 2012, we published a nearly identical report in which a patient also lost consciousness in the PACU after an IV push dose of **HYDRO**morphone (ISMP. Medication within IV tubing may be overlooked. *ISMP Medication Safety Alert!* 2012;17[16]:1-2). In that case, the patient's SpO₂ dropped to 40%. The patient had been receiving rocuronium by continuous infusion during a procedure. While the drug had been stopped afterwards, the line had not been flushed. Anesthesia immediately responded, administering neostigmine for blockade reversal as they suspected the problem was caused by flushing residual rocuronium in the IV tubing into the patient when administering the IV dose of **HYDRO**morphone.

We are aware of similar events that have happened when IV lines were not flushed after patients received other high-alert drugs, including fenta**NYL** and oxytocin. In one case, the residual oxytocin left in an obstetrical patient's IV line caused hypertonic, tetanic uterine contractions leading to deceleration of fetal heart rate and fetal hypoxia. Even small doses of residual medications in IV lines in pediatric patients could prove fatal. Thus, depending on the drug concentration, pharmacologic action, IV set volume, and point of injection, harmful unintended doses and overdoses are certainly possible.

When administering medications such as neuromuscular blockers, all residual drug must be flushed before the patient is extubated, or the IV line should be changed, and the source container removed. This should be confirmed at the point of patient "handoff" or transfer of care (e.g., from the surgical suite to the PACU), as the receiving providers may not be aware of the medications that were administered in the previous patient care setting. In addition, all drugs administered IV should be flushed through the IV line to be sure they reach the patient for effect and do not linger in the IV line.

Special Announcements

ADC draft guidelines open for public comment. Automated dispensing cabinets (ADCs) are used by most hospitals as the primary means of drug distribution. Safe use of ADCs can only be achieved through the adoption of standard practices and processes associated with ADC design and functionality. With the help of an expert advisory group, the ISMP ADC guidelines, originally published in 2009, have been updated to reflect current safe ADC practices. The revised guidelines are being shared for public comment prior to their release. Please review the revised draft guidelines and submit your comments to ISMP by **August 31** by visiting: www.ismp.org/node/1107.

Survey on IV push medications. If you are a practitioner who administers intravenous (IV) push medications to ADULTS, please take our survey on IV push medication practices! In the past few years, some practitioners have had to change the way they administer IV push medications due to ongoing drug shortages. In other cases, variability around practices associated with IV push medications has been linked to how practitioners have been taught this critical skill. ISMP is attempting to understand current practices and would appreciate your participation in this survey by **August 31** by visiting: www.ismp.org/ext/49.

To subscribe: www.ismp.org/node/10



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