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ISMP
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Nurse AdviseERR®
Educating the Healthcare Community About Safe Medication Practices

The role of simulation when onboarding healthcare professionals—Part II

Simulation is an evidence-based teaching method that can help facilitate the learning of important safety and quality aspects of patient care by replicating a process or system in a safe environment to gain insight (www.ismp.org/ext/1125). While learning from mistakes is an important part of new hire orientation, involving a patient might risk safety. Even while shadowing seasoned staff, there will never be sufficient opportunity to experience all the complex situations that new hires will eventually face. New practitioners may not be able to observe error-prone scenarios or practice critical tasks under the guidance of a mentor if the critical tasks do not happen during their orientation. It is also likely that situations will be missed in which patients present with rare diseases and corresponding medication therapy.

Current staffing levels and high patient acuity may not allow for an adequate amount of time dedicated to teach new hires and they may be pressured into uncomfortable situations before they are ready. So, during onboarding, how can we add to the new hire's knowledge so they can apply it to clinical practice? Furthermore, how can we best use mistakes that were made in the hospital and from external sources to show new practitioners how they can learn from them? In **Part I** (www.ismp.org/node/115647), we presented how to promote a safety culture during the onboarding process. In **Part II**, we discuss the role of simulations in new hires' medication safety education.

Understanding Simulation

Simulation has been used in many industries such as aviation, spaceflight, nuclear power, shipping, military, and sports (www.ismp.org/ext/1125). These industries are often held up as examples when it comes to risk mitigation and safety. Simulation in healthcare can be used to prepare staff to properly perform certain tasks or processes, utilize critical job-specific tools/devices (e.g., infusion pumps, automated dispensing cabinets [ADCs], compounding technology), or identify and troubleshoot failure modes (e.g., dose error, technology downtime). ISMP has advocated for the use of simulation for certain scenarios highlighted in the following articles: *Emergency preparedness: Be ready for unanticipated electronic health record (EHR) downtime* (www.ismp.org/node/48342), and *Prevent uncontrolled, rapid infusion rates: Confirm infusions are connected to pumps before opening the clamp!* (www.ismp.org/node/38617).

Simulation as Part of Healthcare Education

The National Council of State Boards of Nursing (NCSBN) National Simulation Study: A Longitudinal, Randomized, Controlled Study Replacing Clinical Hours with Simulation in Prelicensure Nursing Education (www.ismp.org/ext/1126) assessed the impact of simulation on educational outcomes in student practitioners. New nursing students were randomized into three groups: a traditional clinical program (control), and students who had either 25% or 50% of their clinical hours replaced by simulation. The students remained in their group for all core clinical courses in their program and were followed for 6 months after graduation, during their first position as a registered nurse (RN). They found that substituting up to 50% of traditional clinical experience with high-quality simulation produced comparable educational outcomes in core nursing courses.

In another study by Advocate Aurora Health, a medication safety "escape room" was used as part of a training module for pharmacists and pharmacy technicians.[1] The escape room included concepts of barcode scanning, look- and sound-alike medications, high-alert medications, and calculations.

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SAFETY wires

Process for using Merck's new prefilled diluent syringe is error prone. Merck received US Food and Drug Administration (FDA) approval for and has begun distributing new prefilled sterile diluent syringes (packaged separately) (**Figure 1**) for reconstituting a lyophilized powder vial of **M-M-R II** (measles, mumps, and rubella), **VARIVAX** (varicella), and **PROQUAD** (measles, mumps, rubella, and varicella) live virus vaccines. The diluent was formerly available only in vials. In general, prefilled syringes are safe options, but in this case, they are already causing medication errors and creating increased risk. The syringes are labeled "**STERILE DILUENT FOR RECONSTITUTION OF MSD LIVE VIRUS VACCINES**." The company's instructions and promotional materials say the syringes should be used to reconstitute the associated vaccine, withdraw the liquid back into the syringe, and then administer (www.ismp.org/ext/1269). However, at the same time, the instructions do not mention the need to relabel the diluent syringe with the vaccine name after reconstitution. So, if there are other prefilled

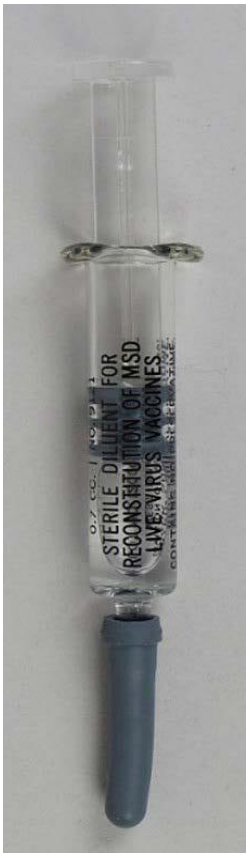


Figure 1. Prefilled diluent syringe for use with Merck vaccines must be relabeled with the vaccine name after reconstitution.

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This allowed for errors to be simulated in a controlled environment to increase medication safety knowledge. Participants reported that the simulation was more engaging than the alternative online self-paced learning modules, as they were communicating with colleagues to escape each room.

What is missing in healthcare practitioner educational programs is a bridge between classroom learning and real-life clinical experience. Simulation can provide such a bridge and protect students from work-related dangers (e.g., infected needles, blades, electrical equipment). Educators can also use simulation to emphasize realistic situations by putting more stress and pressure on practitioners to perform a task. For example, rather than reading about how to administer an injection, new practitioners can practice preparing and administering a vaccine by drawing it up from a demonstration vial using a needle and syringe and injecting into an orange or foam pad. Using simulation to enhance learning can also be used to ensure competency. Consider the difference between requiring a surgeon to pass a written multiple-choice exam on how to perform laparoscopic surgery and having them demonstrate the use of the actual technology in a simulated environment.

Recommendations

Knowing that every organization has limited resources, consider the following recommendations when formalizing or incorporating medication safety simulation into your educational programs:

Start with what you have. The healthcare educator who oversees new practitioner onboarding should identify what simulations are already being performed but are not distinguished as a "simulation" (e.g., programming smart infusion pumps, patient counseling, emergency downtime drills) and incorporate it into a formalized simulation process.

Expand content. Develop simulation videos for staff that involve the identification of medication errors (i.e., overriding an alert in the dose error-reduction system [DERS] when programming a smart pump). In our June 1, 2006, acute care newsletter, we wrote about creating a "room of horrors" with a simulated patient and chart, set up with common items and mistakes that can lead to patient harm. Consider developing simulations to address actual errors that have occurred in your facility or those that have appeared in the ***ISMP Medication Safety Alert!*** Consider including the following errors or hazards as simulation scenarios: selecting the incorrect patient profile in the EHR or ADC, not reading back a verbal order, confusing look-alike medication packaging, preparing an oral medication in a parenteral syringe, administering the wrong medication using an unlabeled syringe, or a misconnection due to not tracing an infusion line before connecting it to the patient.

Use simulation to ensure competency. Develop simulation programs to ensure competency when new staff perform essential medication-related tasks. Provide ongoing simulation opportunities when introducing new procedures or improving how infrequent tasks should be accomplished. The healthcare educator should repeat the simulation with different variables until the learner has become skilled. Once this is mastered, incorporate additional elements such as noise, distractions, and interruptions to better replicate a realistic work environment. Simulated distractions can make staff aware of the impact these can have on their processes. In one school of nursing where students participated in simulations with varied background noises (e.g., music, conversations) and noise levels, the students found that distractions decreased accuracy in medication preparation and administration and led them to take additional time to check their calculations.[2]

Use simulation to validate new processes or technologies. Use simulation to evaluate updates to technologies (e.g., prescribing using new order sets, pump library updates, new drugs or formulations in intravenous [IV] workflow management systems). You can also simulate new workflow processes to test what does and does not work, gain crucial feedback from frontline staff, and identify any potential safety gaps before rolling out large scale changes. Consider having "a day in the life" to run real-life simulations of new technologies/devices to see how they work in your clinical settings with your staff, compared to testing environments utilized by vendors.

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syringes nearby, and they are left on a table or countertop, all will be labeled only as sterile diluent in the same way, and will all look alike. That could lead to someone inadvertently picking up and injecting an unmixed diluent syringe, or not knowing a syringe is already reconstituted, resulting in someone getting a double dose or two different vaccine products. We have already received an error report as well as a complaint about the situation. Also, this removes the option of having parents read the syringe label as part of a process to confirm the right vaccine is about to be given, since it will read "sterile diluent." Of note, there are other vaccines such as GSK's **PRIORIX** (measles, mumps, and rubella vaccine, live) (www.ismp.org/ext/1270), and Pfizer's **ABRYSVO** (respiratory syncytial virus vaccine) that use prefilled sterile diluent syringes, and share the same problem (see the following ***Safety* wire** about a related error).

We reached out to FDA and the manufacturer to notify them of this concern and recommended that manufacturers provide self-adhering labels, packaged with the specific vaccine, for use on the diluent syringe after the vaccine is reconstituted and withdrawn from the vial. For now, to reduce risk with these syringes, create vaccine-specific auxiliary labels to facilitate relabeling. Store the labels with the specific vaccine products.

Influenza vaccine mistaken as diluent meant for RSV vaccine. Pharmacies reported two recent close calls involving patients who were supposed to concurrently receive **FLUZONE** (influenza high-dose vaccine) and **ABRYSVO** (respiratory syncytial virus vaccine). Abrysvo is available in a vial containing lyophilized powder antigen. A practitioner must first dilute it using an accompanying syringe of sterile water for injection and a vial adapter. However, instead of connecting the Abrysvo diluent syringe to the vial, those preparing the vaccines have mistakenly used Fluzone high-dose syringes (**Figure 1**, on page 3). Fortunately, in both cases, the error was recognized prior to administration.

The diluent syringe for Abrysvo looks similar to the Fluzone high-dose syringe,

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Collaborate with various disciplines. Partner with other healthcare practitioners in medication safety simulations (e.g., code response, malignant hyperthermia, EHR downtime), and practice teamwork behavior (e.g., managing high workload, coordinating under stress, effective communication).

Debrief. After each simulation, incorporate a formal debriefing.[3] Provide a safe learning environment for staff to discuss what occurred during the simulation scenario. Explain any "missed" errors to the participant(s) and allow them to ask questions, share concerns, and review what could be improved upon to determine how to better approach future simulations and medication safety processes.

Partner with colleges and universities. All healthcare-related professional schools should include a course on medication safety. Ideally, these courses should incorporate simulations that include common unsafe medication-related processes, medication errors, and high-risk scenarios. Reach out to affiliated or local colleges/universities and ask about the use of simulations in the curriculum. Consider partnering with them to develop ways to strengthen these programs.

References:

1) Kasal T, Sabol K. Novel medication safety training module. *Am J Health Syst Pharm.* 2022;79(Suppl 4):S123–27.

2) Thomas CM, McIntosh CE, Allen R. Creating a distraction simulation for safe medication administration. *Clin Simul Nurs.* 2014;10(8):406-11.

3) Thomas Dreifuerst K. Getting started with debriefing for meaningful learning. *Clin Simul Nurs.* 2015;11(5):268-75.

ISMP List of High-Alert Medications recently updated

Last fall, ISMP conducted a survey on high-alert medications in acute care settings to update our longstanding list. High-alert medications are an essential component of drug therapy, but these medications carry a significant risk of causing serious injuries or even death if used in error. Based on the results of our survey, review of the literature and error reporting databases, and input from an expert advisory group, only one change was made to the list – the addition of tranexamic acid injection.

Tranexamic acid is an antifibrinolytic agent that is used in a variety of hemorrhagic conditions to control bleeding, including postpartum hemorrhage. It works by preventing the breakdown of fibrin, thus promoting clotting. Errors are often related to storage issues and mix-ups with look-alike medication vials, most often anesthetics that are also commonly stored in surgical and procedural locations. When accidentally administered via a neuraxial route, tranexamic acid injection is a potent neurotoxin with a mortality rate of about 50% and is almost always harmful to the patient. Survivors of neuraxial tranexamic acid often experience seizures, permanent neurological injury, and paraplegia (www.ismp.org/ext/1139). ISMP has repeatedly warned against errors with tranexamic acid, including a feature article in the May 23, 2019, ***ISMP Medication Safety Alert! Acute Care*** newsletter (www.ismp.org/node/8706). ISMP also published a ***National Alert Network (NAN)*** warning on September 9, 2020 (www.ismp.org/node/20154).

Our updated list of high-alert medications can be found at: www.ismp.org/node/103.

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Figure 1. Rather than using an Abrysvo diluent syringe (right), a practitioner connected the Fluzone high-dose syringe (left) to the Abrysvo vial via an adapter for reconstitution.

and the dark plunger stoppers make it difficult to read the labels. In addition, both the diluent syringe and the Fluzone syringe have Luer connectors, making them compatible with the vial adapter. A similar error could occur with other powdered vaccines when diluents and other vaccines are kept nearby and are in prefilled Luer-lock syringes. We have notified the US Food and Drug Administration (FDA) about this issue.

To prevent this error, establish a process to keep vaccines and their corresponding diluents together if storage requirements do not differ. Pharmacy should dispense the products together in a bag with an auxiliary label to remind staff to reconstitute prior to administration. If patients require multiple vaccines in which one requires reconstitution while others do not, prepare only one vaccine at a time. For example, start with the vaccine that needs reconstitution and after preparing and labeling the syringe, retrieve and prepare the other vaccine. Barcode scanning prior to preparing and administering a vaccine could help identify an error if the system is set up to require scanning of both the vaccine and corresponding diluent barcodes.

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