Common Missteps With Medication Safety: Rolling a Single Dice, Ineffective Strategies, and Unexecuted Action Plans

Hospital Pharmacy
2018, Vol. 53(1) 25–28
© The Author(s) 2017
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/0018578717747445
journals.sagepub.com/home/hpx

Michael R. Cohen¹

An intravenous (IV) line mix-up in a hospital reoccurred within a few months despite what was thought to be an effective action plan after the initial event. After the first event, an interdisciplinary team had conducted a thorough investigation, identified the causal factors, and developed an action plan hoping to reduce the risk of similar errors. After the second event, the hospital team again conducted a thorough investigation of the event and then carefully reassessed its previous action plan. In the process, the team gained significant insight into what Institute for Safe Medication Practices (ISMP) has identified as 4 common missteps in the pursuit of medication safety:

1. Relying on a single risk-reduction strategy to prevent an error
2. Implementing risk-reduction strategies after an event that may not reduce the risk of a similar error
3. Failing to address all the causes of an error
4. Failing to measure the implementation and effectiveness of an action plan

The Errors and Action Plan

The Initial Error

A patient with gastrointestinal bleeding and hypotension was receiving continuous IV infusions of octreotide and norepinephrine. Both infusions had been compounded by the pharmacy in 250-mL bags, so they were similar in size, and both were placed in brown overwraps to protect the medications from light, making them similar in appearance. They also had similar-looking pharmacy-applied labels on the overwraps. When the volume in both infusions was nearing completion, new infusion bags were hung simultaneously but were interchanged in error. The octreotide bag was spiked with the IV administration set that was loaded into the infusion pump programmed for norepinephrine, and the norepinephrine bag was spiked with the IV administration set that was loaded into the infusion pump programmed for octreotide. As a result, the patient received an overdose of norepinephrine and a subtherapeutic dose of octreotide.

The Initial Action Plan

After investigating the event, the hospital initiated an action plan and provided education to the nursing staff on the following new procedures to help reduce the risk of a reoccurrence:

- Label all infusion lines between the pump and the infusion bag so the label is visible during bag changes
- Trace all infusion lines from the patient, through the pump, and to the medication to verify the correct route of administration, pump, and line prior to starting an infusion or changing the bag
- Use the existing barcode point-of-care (BPOC) system to scan each infusion at the bedside prior to set-up and administration (previous practice had been to “pre-scan” the infusions upon receipt from the pharmacy)

The Recurrent Error

Despite these efforts, a similar error occurred a few months later. A cardiac patient was receiving continuous IV infusions of norepinephrine and **EPINEPHrine**. When new infusion bags were needed for both vasopressors after a procedure in the cardiac catheterization lab, a nurse (who was not involved in the prior event) inadvertently switched the 2 medications while replacing the bags. The IV lines had been labeled; however, the labels had been placed between the patient and the pump, not between the pump and infusion bag as required by the new policy. Because the labels were below the pumps, and the nurse had not traced the IV lines from the patient to the medication per policy (thus failing to encounter the labels during the tracing process), the nurse did not even notice the labels on the tubing. Like the previous error, both medications were similar in appearance,

¹Institute for Safe Medication Practices, Horsham, PA, USA

Corresponding Author:

Michael R. Cohen, President, Institute for Safe Medication Practices,
200 Lakeside Drive, Suite 200, Horsham, PA 19044, USA.
Email: mcohen@ismp.org

having been compounded by the pharmacy in 250-mL bags, placed in light-protective overwraps, and labeled with similar-looking pharmacy-applied labels.

The Missteps

Misstep 1: Relying on a Single Risk-Reduction Strategy (or Rolling a Single Dice)

Prior to the first event, the hospital was primarily relying on a single risk-reduction strategy—nurse vigilance—to prevent line mix-ups. However, a single strategy, particularly one as weak as human vigilance, is rarely enough to prevent errors. Instead, ISMP has long recommended layering numerous high-leverage risk-reduction strategies to create a more robust safety system.

David Marx, a culture and system reliability expert, likens the relative safety of a system to a dice game—with each dice representing a risk-reduction strategy in the layer of the safety net.¹ Rolling a snake eye (1) represents failure; rolling anything else represents success. The more dice you roll, the less the risk of getting all snake eyes, and the safer the system will be due to the simple power of math. The problem is, safety systems are often 1-dice games. As in the initial error described above, the nurse was only one unlucky roll of the dice away from making an error. And, as noted by Marx, “in no place is the single dice deadlier than that of healthcare . . .”¹ Roll a single dice, and harm is only a single failure away. But design the safety system to be 3, 4, or 5 dice away from harm, and you can vastly improve safety.

Misstep 2: Strategies That Will Not Prevent Similar Errors

After the first event, the hospital established an action plan. Two of the planned strategies, if fully and effectively implemented, have the potential to reduce the risk of IV line mix-ups: labeling the lines and tracing the lines from the patient to the medication when changing bags or starting infusions. However, it is less likely that the third strategy—scanning the bags at the bedside—has the potential to reduce IV line mix-ups given that integration of the hospital’s smart infusion pumps with the electronic health record (EHR) had not been implemented. In the absence of interoperable systems, barcode scanning immediately prior to administration can help ensure that the correct patient and medication are selected, but the right medication for the right patient can still be attached to the wrong IV infusion set, access site or port, or infusion pump, leading to the same type of line mix-up. The scanning process only helps ensure that the correct medication is in hand, not that it has been connected properly.

It is quite common to identify vulnerabilities during event investigation that are not actually causal to the event. The “pre-scanning” of infusion bags is an example, in the case

cited above. While it is crucial to patient safety to design strategies to address these identified noncausal vulnerabilities, care must be taken to avoid relying on these strategies to prevent similar errors when they don’t address the causal factors.

Misstep 3: Failing to Address All Causal Factors

During analysis of the first event, the hospital identified similarities in the appearance of both infusions as being causal to the event. However, the action plan created after the initial event did not address this causal factor, which was also contributory in the subsequent event.

Misstep 4: Failing to Measure the Implementation and Effectiveness of Action Plans

While the hospital spent considerable time educating nurses about the planned risk-reduction strategies, a structured format did not exist to

- motivate staff to implement the action plan (e.g., coaching around the risk associated with not labeling or tracing lines),
- test the action plan on a small scale and revise it as necessary before spreading it throughout the hospital,
- provide support for implementation of the strategies (e.g., making them compatible with the workflow, identifying and addressing any barriers),
- monitor the progress with implementing the strategies in the action plan, and
- measure the effectiveness of the action plan to reduce the risk of line mix-ups

Recommendations

To avoid the 4 common missteps described above, ask yourself the following questions when working toward addressing a medication safety hazard or error:

Is There a Single Pathway to an Error, Particularly a Harmful Error?

To initially identify and prioritize potential hazards that may require action, look for tasks associated with the medication-use process that are just one human or equipment failure away from a potentially harmful error reaching a patient. These are the tasks that leave patients highly vulnerable to errors. Look at how many layers of safety have been established (in practice, not on paper)—how many dice are you rolling to prevent or detect the error, or mitigate patient harm? Marx notes that the number of dice you roll is a strong proxy for patient outcomes—The more dice you roll, the better outcomes you will achieve.¹ We need to make sure patients

are multiple errors away from harm by implementing multiple risk-reduction strategies, and not relying on just one or two to protect patients.

Are We Rolling at Least Three Dice When Building an Action Plan?

Build your action plan to address an identified hazard or error with multiple layers of safety—at least 3 very reliable strategies are suggested by Marx.¹ While the elimination of unnecessary steps that don't improve safety in a process is key to the principles of lean and the simplification of processes is key to the principles of risk reduction, keep in mind that the layering of value-added strategies to address a hazard is key to reliable outcomes.

For example, in the events described above, additional strategies that could add layers and make the safety system more reliable may include changing each bag independently, not simultaneously, completing the process for one bag before bringing the next bag to the pump; requiring an independent double check by a second practitioner when starting or changing infusions that contain certain high-alert medications; and making infusions that require light-protective overwraps more distinctive (e.g., large, auxiliary drug name labels) to better distinguish between them. Also, integration of a hospital's smart infusion pumps with the EHR allows for the potential to receive a system alert if the correct medication is inadvertently placed on the wrong smart pump or channel, although the effectiveness of the technology is dependent on the workflow and sequence of scanning.

As was done by the hospital team in the event described above, also be sure to seek out safety experts and/or search the literature to learn about similar external hazards or errors that have been identified and the recommended steps to reduce their risk.

Does the Action Plan Address All Causal Factors Associated With a Hazard or Error?

Each causal factor identified during a risk analysis or event investigation should be clearly linked to one or more strategies. A clear linkage between proposed strategies and causative factors helps not only ensure that all causative factors have been addressed, but also helps staff follow the logic of the planned actions, achieves buy-in for implementation of the new strategies, and enhances perception of the risks associated with the targeted tasks. Be sure to identify all system-based causes of a hazard or error, as well as any human components, including human errors and behavioral drift. Remember, we as humans have a high propensity to drift and make unsafe behavioral choices. Even the tiniest incentive—to save time, for example—will often lead to cutting a corner if we fail to see any significant risk associated with the behavior.

Do the Planned Actions Have the Potential to Prevent or Detect Hazards or Mitigate Patient Harm?

Once an action plan has been identified, it is imperative to reassess whether each strategy could potentially prevent or detect the hazard or error, or at least mitigate patient harm if an error reached a patient. Regardless of their overall strength in reducing the risk of errors, if the planned strategies do not specifically address the causal factors, they will not be effective. You always need to ensure that you are rolling reliable and potentially effective dice.

How Will I Know If the Action Plan Has Been Implemented and Whether It Is Successful?

An action plan is only useful if it results in positive change. Realistic plans must be made for execution of the action plan, which include testing on a small scale, addressing any barriers before widespread implementation throughout the hospital, and a process for directly observing and measuring progress toward implementation of each strategy. Furthermore, the impact of the entire action plan must be measured to determine its effect and whether it has been successful in reducing risk. Even the best laid plans don't always work out; if that happens, new ways for dealing with the risks need to be developed.

Conclusion

Many health care providers, including those at this hospital, have put a lot of work into the pursuit of medication safety to protect patients from errors, accidents, and injuries. As a group, we've gained a lot of expertise in event investigation and identifying the causal factors associated with hazards and errors. But all that work can be for naught if the most effective risk-reduction strategies are not layered deeply to create a robust safety system, if the planned actions are not actually implemented throughout the organization, and if the actions are not measured to ensure their effectiveness in reducing the targeted risk.

VinCRISTine Extravasation Unlikely With Minibags

Twelve months of data collected at The Johns Hopkins Hospital found zero cases of extravasation among more than 1300 minibag administrations of intravenous (IV) vinCRISTine after a recent change from administering the drug from a syringe. These results were presented at the 2017 Oncology Nursing Society (ONS) 42nd Annual Congress (www.ismp.org/sc?id=2921).

ISMP Targeted Medication Safety Best Practice 1 calls for dilution of IV vinCRISTine in a minibag rather than dispensing and administering the drug in a syringe (<https://www.ismp.org/best-practice/1>).

ismp.org/tools/bestpractices/TMSBP-for-Hospitals.pdf). This reduces the risk of an accidental mix-up with intrathecal medications, which are given via a syringe. Such a mix-up has been nearly 100% fatal. Still, it has been difficult to make this change at some locations, because nurses are so used to administering vesicants—other than continuous infusions—as an IV push through the side port of a free-flowing IV line.

Per the presenters, one barrier to standardizing vinCRISTine administration in minibags is the fact that some nurses believe the risk of extravasation is higher than when manually pushing the agent through the IV line. Other barriers noted by the researchers included a lack of understanding of the risk of death associated with central nervous system

administration of vinCRISTine, as well as an insufficient understanding of how to properly administer vinca alkaloids via a minibag. Hopefully, these new data will help convince hospitals that have yet to make the switch to minibags for vinCRISTine. Infusion from a minibag is also supported by The Joint Commission, the World Health Organization, the Oncology Nursing Society, and the National Comprehensive Cancer Network.

Reference

1. Marx D. Play with three dice, when you can. What We Believe. *Outcome Engenuity*. 2017;1(3):1-2. www.ismp.org/sc?id=2924.