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ISMP Institute for Safe Medication Practices
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Acute Care
ISMP Medication Safety Alert!®
Educating the Healthcare Community About Safe Medication Practices

Why scan "harmless" saline infusions and flush syringes? It might not be what you think!

Problem: Compared to the high-alert medications that practitioners frequently administer, one might argue that "normal saline" or 0.9% sodium chloride injection, is benign. Even in hospitals that are committed to barcode medication administration (BCMA) scanning, we find that staff are not consistently scanning normal saline products, including intravenous (IV) infusion bags and 0.9% sodium chloride flush syringes. The greatest danger is not that the practitioner might administer saline to the wrong patient but rather having the notion that the saline product is "harmless," causing the practitioner to skip scanning, then inadvertently administering an unordered IV medication instead of saline.

There are other reasons why practitioners may not scan barcodes on saline products. By design, in some organizations, prescribers do not enter orders for these products so there is not a prompt on the medication administration record (MAR) to scan. In addition, saline and medication flush syringes are often stored in areas like perioperative, radiology, or emergency departments that may not use BCMA, and are used in situations when barcode scanning may not be practical (e.g., code). Depending on the workflow, a nurse may not bring a computer on wheels and/or scanner to the patient's room if they are planning to simply flush an infusion line with saline. A non-pharmacy department, like central supply or materials management, may purchase sodium chloride infusions and flushes, so they may not be stored in the automated dispensing cabinet (ADC) or medication rooms. Therefore, nurses might not associate these as products that they should scan prior to administration.

Scan Saline Flushes

ISMP has written several times about the importance of scanning sodium chloride flushes. In our September 8, 2022 article, *Scan before you flush*, we shared that due to drug shortages, organizations have often purchased products in short supply from different manufacturers. This can result in the product looking different than what practitioners are used to seeing. In one hospital, a pharmacy technician placed heparin flush syringes in a bin intended for saline syringes, which looked similar. Fortunately, a nurse caught this mix-up prior to administration by using barcode scanning.

In our February 13, 2025 article, *Medication syringes may be mistaken for sodium chloride flush*, we wrote about a nurse who removed what she thought was a 10 mL 0.9% sodium chloride flush from a tray in the patient's room, then almost gave it during a bedside procedure. Before administration, the nurse read the label and identified that the syringe contained phenylephrine 1,000 mcg/10 mL instead of saline. The prescriber ordered the phenylephrine to be stored at the bedside in case the patient experienced hypotension during the procedure. The hospital had purchased the phenylephrine syringe from STAQ Pharma, a 503B outsourcing facility. The hospital reported that the phenylephrine syringe previously had a red cap, but now has a white cap, similar to the sodium chloride flush syringes (BD) (**Figure 1**). STAQ Pharma told the hospital

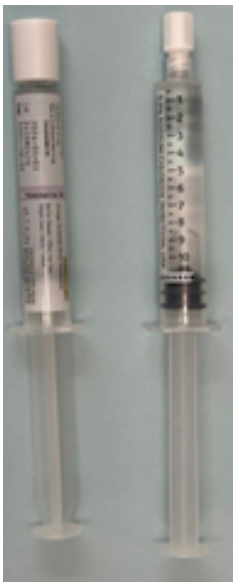

Figure 1. Instead of a 0.9% sodium chloride flush (right, BD), a nurse nearly administered phenylephrine 1,000 mcg/10 mL (left, STAQ Pharma), packaged in a similar-looking syringe that was kept at the bedside prior to a procedure.

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Remembering Dr. Lucian Leape

We were saddened to learn of the passing of our friend, Dr. Lucian L. Leape, on June 30, 2025. Dr. Leape was a former pediatric surgeon and researcher whose contributions in the 1990s laid the groundwork for the patient safety movement. After witnessing recurring medical errors that resulted in significant patient harm and death, Dr. Leape left his surgical practice to collaborate with colleagues on what became known as the Harvard Medical Practice Study, which chronicled for the first time the number of injuries and deaths that resulted from medical error.

Dr. Leape, along with Dr. David Bates, were the recipients of an ISMP **Cheers Award** in 1999 for their medication safety research, including their published work on the impact of intensive care unit-based clinical pharmacists in reducing adverse drug events. Dr. Leape was also the inaugural recipient of the ISMP **Lifetime Achievement Award** in 2001. He was honored for publication of the Harvard Medical Practice Study, which led to the landmark report, "To Err Is Human: Building a Safer Health System," published in 1999 by the Institute of Medicine (now the National Academy of Medicine). Through this work, Dr. Leape and colleagues exposed a new culprit in "adverse events"—the system. He immediately became a champion of the "medical error movement" and became a leading advocate of the non-punitive, systems approach to error prevention.

Dr. Leape often included ISMP in discussions on how to improve patient safety. He worked closely with us to develop ***ISMP's Hierarchy of Effectiveness of Risk Reduction Strategies***. We are keenly aware of the pivotal role he played in making ISMP what it is today—we would not be the same organization without him. Most of all, Dr. Leape's research will forever be his legacy, as he helped in ways that saved

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that they changed the phenylephrine cap color from red to white due to reported look-alike packaging concerns with their succinylcholine syringe.

In another case, a hospital recently procured atropine sulfate injection 1 mg/10 mL syringes manufactured by Amneal. A nurse contacted the pharmacy to report that the atropine syringes were nearly indistinguishable from the 0.9% sodium chloride flush syringes made by BD (**Figure 2**). The nurse noted that these atropine syringes do not come with an overwrap like their previously purchased atropine product, and the labels and printing on the syringe were incredibly small, making it difficult to identify the contents.

In yet another case, a hospital reported that once a practitioner removes the overwrap, sodium chloride 0.9% flush syringes (Excelsior Medical) look very similar to calcium chloride 1,000 mg/10 mL syringes (Medefil) (**Figure 3**). This led to a close call in an operating room where barcode scanning has not been implemented.

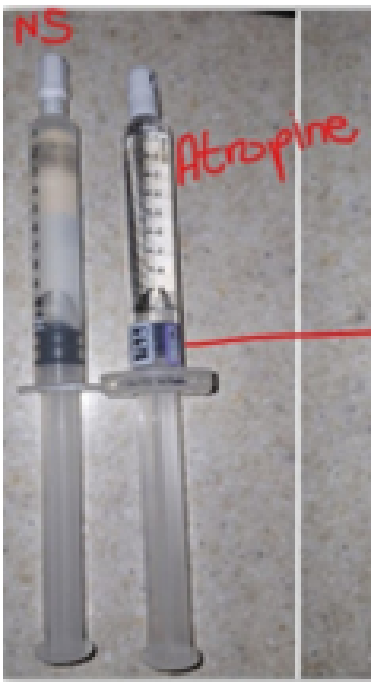

Figure 2. The 0.9% sodium chloride flush syringe by BD (left) looks similar to the atropine syringe by Amneal (right).

Scan Saline Infusions

Errors and close calls can also occur with premixed saline infusions. In a recent case, a radiology technologist removed a 100 mL bag of what he thought was 0.9% sodium chloride from a bin in the imaging center. When loading the fluid into the computed tomography (CT) contrast power injector, the technologist noticed the label looked different than the one on the bag he typically used. He did not administer the fluid and immediately brought the bag to the pharmacy. The pharmacist identified that it was gentamicin 80 mg/100 mL in 0.9% sodium chloride injection. The pharmacist called the imaging center and asked the nurse to check the bin where the 100 mL saline bags were stored. She found additional bags of gentamicin, which were sequestered. Baxter makes both products, and they come in similar packaging (**Figure 4**, page 4).

Figure 3. The 0.9% sodium chloride flush syringe by Excelsior Medical (left) looks like the calcium chloride syringe by Medefil (right), once removed from their overwraps.

In this hospital's imaging center, prescribers were not required to enter orders for 0.9% sodium chloride in the electronic health record (EHR) when these products were used to test for IV line patency. Although radiology technologists administered some medications in the imaging center, this area did not have an ADC or use barcode scanning prior to medication administration.

Purchasing 0.9% sodium chloride for the imaging center was left to central supply. The person ordering the supply typed "NaCl 100 mL" into the ordering software. The first option was for gentamicin sulfate in 0.9% sodium chloride injection, which they selected and ordered in error. The shipment was delivered to the imaging center 3 months prior to the event. The radiology technologist did not read the label or scan the barcode before restocking the bags, then unknowingly added the gentamicin bags to the 0.9% sodium chloride bin.

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thousands of lives from medical errors and harm. Healthcare practitioners worldwide will be forever grateful for his work and dedication. We will greatly miss Dr. Lucian Leape and offer our deepest condolences to his family.

SAFETY briefs

Topical medication in luer syringe was injected. A 5-year-old child presented to the emergency department with a dog bite to the wrist. The prescriber applied 1.5 mL of topical lidocaine gel, which also contained **EPINEPH**rine and tetracaine (often referred to as L.E.T.—an abbreviation we do not recommend using) with the intention of closing the bite wound with a stitch. Even though the mixture is for topical use only, Fagron (a 503B outsourcing facility) packages the gel in a parenteral (luer) syringe (**Figure 1**). Due to the child's distress and inconsolable crying, the prescriber decided to forgo the stitch. Since the child was not vaccinated, the prescriber ordered intramuscular (IM) doses of tetanus vaccine and tetanus immune globulin. The nurse placed the vaccine and immune globulin syringes next to the partially used syringe containing topical lidocaine, **EPINEPH**rine, and tetracaine gel in the child's room. The nurse attached a needle to what she thought was the syringe containing

Figure 1. Parenteral needle attached to luer lock syringe containing the topical lidocaine, **EPINEPH**rine, and tetracaine gel by Fagron.

tetanus immune globulin and administered the IM injection. After administration, she scanned the medication barcode and identified it was the topical lidocaine, **EPINEPH**rine, and tetracaine gel. The prescriber contacted Poison Control who advised them to monitor the child

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Of the 25 gentamicin bags purchased, 17 were located, and it was presumed that 8 patients might have received 30 to 50 mL (24 to 40 mg) of gentamicin in error. The radiology director contacted the physicians of the patients who may have been impacted. A pharmacist reviewed the EHR for all of the potentially impacted patients to assess allergies/reactions, weight (to determine mg/kg gentamicin dose potentially administered), laboratory monitoring (e.g., renal function), and if any readmissions could be correlated. They did not identify any actual patient harm.

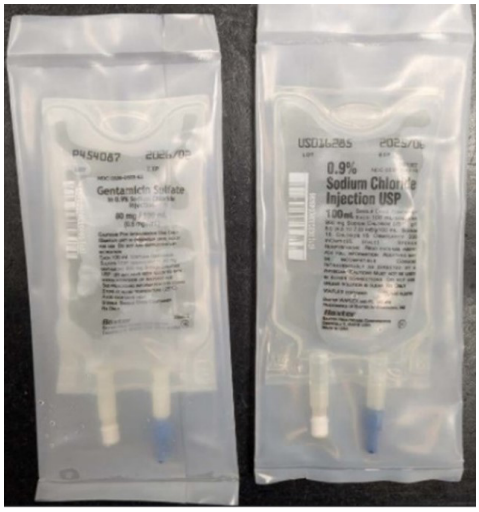

Figure 4. Bags of gentamicin 80 mg/100 mL injection (left) were found mixed in the bin used to store bags of 0.9% sodium chloride 100 mL injection (right).

When further investigating, they discovered that central supply had access to the entire drug product catalog in the ordering software, including some high-alert medications (e.g., concentrated potassium chloride, heparin). They had a process for pharmacy to review orders for "pharmaceuticals," but the pharmacy was not required to review the imaging center's orders. To complicate matters, medication names in the ordering system were long and detailed, often hard to interpret, and some selections lacked product photos.

Safe Practice Recommendations: Organizations should evaluate practices around scanning sodium chloride products and consider the following recommendations.

Evaluate workflow. Review the current workflow at all steps of the medication-use process, including ordering, prescribing, dispensing, storing, and administering saline. Consider conducting a failure mode and effects analysis (FMEA) to determine potential risks and develop mitigation strategies. Require prescribers to enter orders in the EHR for all medications **and** fluids, including 0.9% sodium chloride (or include in order sets). When possible, hospitals should have ADCs in clinical areas such as the radiology department, requiring pharmacist review and approval of orders prior to access. Gather feedback from end users about barriers to scanning (e.g., access to equipment) and solutions to address them.

Restrict medication purchasing. Review medication and fluid (including saline fluids and flush syringes) ordering policies and procedures for all organizational locations (e.g., radiology, perioperative areas, outpatient infusion centers), including those purchased by non-pharmacy departments. Test your medication ordering software and ensure medications are restricted to pharmacy purchasing unless an exception is specifically justified. Consider creating custom order templates within the software so that only approved products can be purchased. If products are difficult to find or do not have photos, provide feedback to the vendor.

Maximize barcode scanning. Use barcode scanning when receiving, dispensing, filling the ADC or other storage location, and prior to administering any medication, including sodium chloride infusions and flush syringes. The ISMP *Targeted Medication Safety Best Practices for Hospitals*, *Best Practice 18,* calls for maximizing the use of BCMA by expanding use beyond inpatient care areas, including perioperative areas, radiology, and the emergency department. Regularly observe scanning practices and review scanning data (e.g., compliance, alerts) to identify products commonly administered without scanning to help uncover potential workflow or product issues. Supervisors should be on constant lookout for staff who bypass this important safety system; gather feedback from end users about barriers to scanning (e.g., access to equipment) and solutions to address them.

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via cardiac telemetry and hourly neurological checks for 6 hours. No harm was reported.

ISMP has written about this type of error multiple times, most recently in a ***Worth repeating*** article, *Never prepare oral or topical medications in a parenteral syringe*, published February 23, 2023. Although the lidocaine, **EPINEPH**rine, and tetracaine gel syringe has a warning on the cap that says, "FOR EXTERNAL USE ONLY" in large font and a warning in smaller font on the barrel of the syringe that says, "TOPICAL USE ONLY" (**Figure 2**), once the cap is removed, there is only the smaller font warning that can easily be missed.

Figure 2. When practitioners remove the cap from the topical lidocaine, **EPINEPH**rine, and tetracaine gel by Fagron, they can attach a needle to the parenteral syringe or connect the syringe to an intravenous (IV) set.

We reached out to Fagron again and recommend that they package the topical lidocaine, **EPINEPH**rine, and tetracaine gel in a container that practitioners would expect, such as a tube or jar, to prevent the inadvertent administration of the medication via the parenteral route. If your organization uses this product, consider purchasing an alternative product that is not packaged in a parenteral syringe. Educate practitioners about the importance of scanning medication barcodes prior to administration.

Hiberix diluent syringe administered as vaccine. **HIBERIX** (*Haemophilus* b conjugate vaccine) is recommended to prevent invasive disease caused by *Haemophilus influenzae* type b (Hib) in pediatric patients. It may also be considered for adults who have not received the childhood Hib series and are at increased risk for invasive Hib disease due to sickle cell disease, anatomic/functional asplenia, or splenectomy. The vaccine was previously only available in cartons containing ten single-dose vials of lyophilized antigen

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Prompt nurses on the MAR. Prompt nurses on the MAR to scan barcodes on saline infusions and flush syringes prior to administration or flush of IV lines.

Conduct a safety review. Have pharmacy complete a proactive review of the packaging and labeling of products when purchased, especially during drug shortages when products could be changing frequently. Consider purchasing a product from a different vendor when problems are identified. If look-alike products must be purchased, implement strategies (e.g., auxiliary labels) to call out their differences and ensure availability and use of BCMA.

Communicate product packaging changes. Communicate with staff when there is a change in product packaging, or when a new product is available, and review the packaging, storage location, and other pertinent information.

Safeguard storage. Store look-alike products separately and in a way that keeps their labels as visible as possible. Manufacturers' and outsourcers' product labels and packaging might change, so identifying physical features (e.g., cap color, label color) alone should not be used to identify any medication. This speaks to the importance of scanning the barcode along with reading the product label.

Educate staff. Provide practitioners with initial and annual barcode scanning competency assessments, emphasizing the risk and rationale for scanning all saline infusions and flushes to detect the wrong product selection.

Report errors. Report errors that reach patients and close calls with saline internally and to ISMP. Consider implementing a good catch program to recognize staff that caught an error using barcode scanning.

Special Announcements

Apply for New Fellowship

Applications are being accepted for the first ***Ochsner Children's & ISMP Safe Medication Management Fellowship***! This unique one-year program for pharmacists offers the opportunity to learn from and work with top experts in medication safety while supporting error prevention strategies in pediatrics at Ochsner Health. **The fellowship requires working onsite at Ochsner Health in New Orleans, LA** and remotely with ISMP. For more information and to apply, please visit: *Safe Medication Management Fellowships*.

Nominations open for CHEERS AWARDS

Each year, ISMP honors various healthcare disciplines that have demonstrated an exemplary commitment to medication safety through innovative projects with an ISMP **CHEERS AWARD**. Nominations for this year's **CHEERS AWARDS** will be accepted through **August 1, 2025**. For more details and to submit a nomination, click here.

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component and ten single-dose vials of sterile saline diluent. Before administration, 0.6 mL of diluent must be used to reconstitute the lyophilized antigen. More recently, GSK, the manufacturer of Hiberix, has made the vaccine available in cartons containing ten single-dose vials of lyophilized antigen and ten single-dose, prefilled syringes containing sterile saline diluent. Before administration, the volume of diluent in the prefilled syringe must be injected into the vial containing the lyophilized antigen.

A patient status-post splenectomy presented to an outpatient pharmacy for the Hiberix vaccine. The pharmacist who selected the vaccine from storage and verified the order was familiar with the two-vial vaccine formulation but not the new carton configuration containing vials of lyophilized antigen and prefilled syringes of diluent. They assumed the prefilled syringe of diluent contained vaccine.

The patient decided to come back at a later time to receive the vaccine, so the pharmacist returned the syringe to the refrigerator. It was then that they realized the prefilled syringe only contained diluent. They looked inside the carton and found three vials of lyophilized antigen "hidden" under the carton flap. However, they only found one diluent syringe in the carton. It was determined that two patients likely received only the diluent in previous vaccine administrations.

To reduce the risk of errors, establish a process to keep the Hiberix vial and prefilled syringe together (e.g., band or bag them together). Post a note or signage where these products are stored alerting staff that one syringe and one vial will be needed. Work with computer vendors and/or internal developers to configure the system to enable (and require) scanning of both the vaccine and corresponding diluent barcodes during preparation and administration. When the pharmacy receives a new product, conduct a review to identify potential risks with the product's design and storage. Educate all vaccinators about any new vaccines or vaccine configurations. Provide regular competency assessments for all staff who prepare and administer vaccinations.