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ISMP
An ECRI Affiliate

# Acute Care ISMP Medication Safety Alert!®

Educating the Healthcare Community About Safe Medication Practices

## An interview: Success with barcode scanning to enhance perioperative medication safety

A few months ago, ISMP interviewed Dustin Carneal, PharmD, from the Crystal Clinic Orthopaedic Center in Akron, Ohio, about the implementation of barcode scanning technology in their perioperative and procedural settings. The Crystal Clinic Orthopaedic Center is a physician-owned hospital system that has 22 operating rooms in two locations, which accommodate a volume of approximately 17,000 medical and/or surgical procedures each year. Total knee, hip, and shoulder replacements, as well as spinal fusions, are some of the more frequent procedures performed there. In 2021, the health system completed its transition to a Cerner electronic health record (EHR) and has adopted barcode scanning technology in all perioperative and procedural settings prior to medication administration. The ***ISMP Medication Safety Self Assessment for Perioperative Settings***, which included barcode scanning technology as a best practice, served as motivation and assisted Dustin in discussions with leadership to adopt the technology.

We are publishing our interview with Dustin because newsletter readers told us in our 2022 readership survey (www.ismp.org/node/33420) that, in future newsletters, they wanted to see how other organizations have implemented the 2022-2023 ***ISMP Targeted Medication Safety Best Practices for Hospitals*** (www.ismp.org/node/160), including *Best Practice* #18 associated with expanding the use of barcode scanning technology to short- and limited-stay locations such as perioperative and procedural areas.

**ISMP Which patients and products are required to be scanned for verification before medication administration in the perioperative setting?**

Dustin In the perioperative setting, leaders expect the barcode on every patient's identification bracelet and the medications they receive to be scanned prior to administration. This means that perioperative medications, including plain hydrating infusions and irrigation fluids, require barcode scanning before administration; the barcode on all patients' identification bracelets is also scanned to verify both the patient and the product. We had to decide up front which perioperative products were "drugs" that required scanning. For example, we decided that skin preparations like ChloraPrep were "drugs" that we wanted to barcode and scan. We currently require some anesthesia-provider medications to be scanned and documented on the medication administration record (MAR), including antibiotics, tranexamic acid, and certain anesthetics. Cerner has yet to release barcode medication administration (BCMA) within their anesthesia module, but we hear it is coming soon!

The barcodes on all patients' identification bracelets and most medications are scanned in the traditional perioperative setting, such as the preoperative holding areas, operating rooms (ORs), procedure rooms, and post-anesthesia care units (PACUs), as well as non-traditional perioperative settings such as outpatient units that perform procedures, and radiology. We are currently scanning all contrast media, radiopharmaceuticals, medications, and flushes administered in radiology, including during interventional radiology and pain management procedures.

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## SAFETY briefs

**Pfizer and FDA respond to Paxlovid error reports.** In an August 5, 2022, letter to healthcare providers, Pfizer and the US Food and Drug Administration (FDA) communicated about wrong-dose medication errors associated with the prescribing, dispensing, and administration of **PAXLOVID** (nirmatrelvir and ritonavir) (www.ismp.org/ext/967). ISMP previously published a special alert about Paxlovid errors on January 3, 2022 (www.ismp.org/node/29033), soon after FDA issued an Emergency Use Authorization (EUA) for Paxlovid on December 22, 2021. ISMP also published an analysis of wrong-dose Paxlovid errors reported to both ISMP and FDA in our June 30, 2022, newsletter (www.ismp.org/node/32452).

As mentioned in the Pfizer and FDA letter, as well as in the ISMP publications,

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## ISMP perioperative guidelines are now available!

New guidelines for safe medication use in the perioperative and procedural settings were recently finalized and are now available on our website at: www.ismp.org/node/31601. The ***ISMP Guidelines for Safe Medication Use in Perioperative and Procedural Settings*** were developed after holding an invitational, multi-stakeholder, virtual National Perioperative Summit last fall, analyzing the findings from the ***ISMP Medication Safety Self Assessment for Perioperative Settings***, reviewing the current literature, and analyzing perioperative errors reported to ISMP. The guidelines focus on best practices associated with labeling medications in all phases of perioperative and procedural care, common practices that limit the protections offered by proven safety technologies, and the use of barcode scanning in these settings. Please see **page 6** for additional information about our newest set of guidelines!

> Perioperative barcode scanning — continued from page 1

**ISMP What was your workflow associated with medication administration in perioperative settings before and after implementing barcode scanning technology?**

Dustin Before implementing barcode scanning technology, we used preference cards submitted by surgeons to retrieve medications from non-profiled automated dispensing cabinets (ADCs) before each procedure. There were few actual orders for the medications used perioperatively, and they were infrequently verified by a pharmacist prior to administration. Staff historically administered the medication and documented it in the patient's medical record.

Now, surgeons enter intraoperative orders, planned mostly during the preoperative clinic visits. The orders are initiated upon the patient's arrival for surgery, and a pharmacist verifies the medication orders prior to surgery. The medications are then removed when needed by the perioperative staff from profiled ADCs. The barcode on the patient's identification band is scanned, as well as the barcode on the medication, intravenous (IV) solution, or irrigation solution using a non-tethered scanner, and the medications are administered and automatically documented in the EHR.

**ISMP Implementing barcode scanning technology in the perioperative setting is a complex task. Where and how did you start?**

Dustin This was a 2-year journey for us. We started by identifying interdisciplinary champions and involving them from the start. This included pharmacy staff, anesthesia providers, and other perioperative practitioners.

While it was no easy task, pharmacy champions began by gathering all the preference cards for procedures and creating orders and order sets for each procedure based on the preference cards. We also created kits for the shorter procedures, such as spinal injections and hand surgery. Each week, we met with specific surgeons, one-on-one, to ensure the accuracy of the kits and preference cards. These kits (physical and virtual) were stocked in profiled ADCs in the preoperative holding area, operating and procedure rooms, and PACU. The kits are only removed after a pharmacist has verified the medication orders. The kits (and the medications) are not available via ADC override.

At the same time, the circulating nurses began to standardize all the procedural order sets and build master order sets. Again, they used the preference cards to build in surgeon "favorites" with alternatives (for times of shortages or allergies), and appropriate clinical decision support was built into the prescribing system. If the physician saved a "favorite" with a specific dose, the clinical decision support was overridden. The standard order sets and physician "favorites" greatly improved appropriate prophylactic antibiotic selection, and proper medication dosing increased from 53% in 2020 to 92% in 2021. When we met weekly with specific surgeons to ensure the accuracy of the orders and kits, circulating nurses and information technology (IT) staff were also present to ensure the accuracy and acceptance of the standard order sets and to capture the physicians' "favorites."

We identified a standard change management process and then described the new workflow for select cases. We then tested the standard order sets and kits for ADC efficiency, and simulated the more complex cases to make sure unnecessary time was not added to the case due to barcode scanning, and to ensure fast room turnaround time. We also worked with nurse champions to identify MAR documentation limitations and adjusted the orders and MAR settings for efficient workflow and intraoperative flexibility.

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prescribing and dispensing errors are occurring widely. However, many wrong-dose errors have also occurred during patient self-administration and generally involved patients incorrectly taking the wrong combination of nirmatrelvir and ritonavir tablets from blister cards. In their letter, Pfizer noted that they had revised the *Fact Sheet for Patients, Parents, and Caregivers* to address wrong-dose errors that might occur during patient self-administration. The revised *Fact Sheet* (www.ismp.org/ext/968) shows how the medication is labeled and informs the patient how to correctly take Paxlovid. Each dispensed prescription of Paxlovid should include a *Fact Sheet for Patients, Parents, and Caregivers*. It is also critical to educate the patient at the time of dispensing.

It is mandatory for practitioners to report to FDA errors with medications authorized under an EUA (www.fda.gov/medwatch/report.htm). But please take a moment to report any Paxlovid errors to ISMP, as well (www.ismp.org/report-medication-error).

HIGH-ALERT **Risk of prescribing an overdose in athenahealth's EHR.** We recently received reports of issues with athenahealth's electronic health record (EHR), which is used mostly in ambulatory care. For a period of time in July 2022, if a dose less than 1 was entered without a leading zero for a new prescription, the decimal was removed (disappeared), leaving the dose 10-fold greater than intended. For example, if the intended dose of 0.2 mg was entered as .2 mg (without a leading zero), the dose would be saved as 2 mg! In addition, if a dose of medication less than 1 was entered with an ending (redundant) zero (e.g., in the hundredth position), the decimal was removed but the ending zero remained, which could result in a 100-fold overdose! So, if an intended dose of 0.2 mg was entered as .20 mg, the dose would be saved as 20 mg! This could lead to overdoses, patient harm, or even death with some high-alert medications, such as morphine. We are uncertain if placing a zero before the decimal point (0.20 mg) would alleviate the problem with adding a redundant zero after the decimal point at the end of the dose.

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**ISMP How did you handle patient identification and scanning the barcode on an identification band that might be hidden under sterile drapes intraoperatively?**

Dustin Perioperative and admission staff received a list of patients and their procedures the day prior. Depending on the surgical or procedural site, we applied patient identification bands on limbs that could be accessed during the procedure. For example, we put an identification bracelet on the ankle if we knew both arms could be covered by surgical drapes, or we put an identification bracelet on the left or right wrist on the opposite side of the surgical procedure. In some cases, we applied two identification bands on the patient if we were not certain the identification bracelet barcode could be reached during surgery. Additionally, a workflow was implemented to ensure the proper chart was open upon patient entry to the operating room. The patient's identification band barcode is scanned upon entering the operating or procedure room. So, if the identification band barcode can not be scanned during the procedure, the staff have already verified the patient, which is also confirmed during the surgical "time out." Also, they have already ensured that one chart, the proper chart, is open.

**ISMP What were some of the other significant barriers to implementing the technology in perioperative settings, and how did you overcome those barriers?**

Dustin First, not all products used in the perioperative setting have a barcode. We had to first decide which products would be considered a "drug" and make sure each had a functional barcode. It took a lot of manpower to identify all the products utilized, test all the barcodes up front, and build a uniform workflow for similar items such as irrigation solutions. There were also items with two barcodes, one with the NDC (national drug code) number and one with the expiration date and lot number. So, we developed and provided education around which barcode to scan.

We also had to reduce the number of nuisance alerts practitioners would receive. For example, pharmacists (and to some degree prescribers) received a lot of duplicate therapy alerts for any product that contained sodium chloride (5,000+ alerts/day initially). It took 10 months of working with IT staff and Cerner representatives to reduce the non-meaningful alerts, but now we have only meaningful alerts that fire.

Also, we needed to ensure that nurses could modify the MAR to document what had actually been administered to a patient. There were a lot of EHR limitations for perioperative medication orders that we needed to work through.

**ISMP Did you have to increase pharmacy staffing to implement barcode scanning technology in perioperative settings?**

Dustin For the EHR build and maintenance, there was an increase in staff to ensure the safety of our patients. However, with all perioperative orders being entered electronically, pharmacists now had the capability to verify orders anywhere in the hospital. We found the best place to have these pharmacists was at the point of patient care. So our pharmacists transitioned to decentralized clinical roles, working in perioperative locations to verify medication orders and to assist in patient care. This also allowed pharmacists to resolve any questions about allergies, answer questions about medications, and review drug interactions. Having pharmacists verify orders in preoperative locations also prevented a delay in accessibility to medications in the profiled ADCs once the procedure started.

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The initial fix for this technology safety flaw was weak: practitioners had to *remember* to always enter a leading zero and to avoid entering a trailing (redundant) zero. Another strategy was to select a prepopulated option from the dose field drop-down menu to ensure the correct dose was ordered. When we reached out to the vendor, they notified us that this issue had been resolved as of July 28, 2022. However, we encourage athenahealth users to test their systems to ensure this safety flaw has been corrected in their EHR. If it has not been corrected, please reach out to athenahealth, and also send us an email to report the problem.

ISMP has received reports involving serious errors with other EHR software vendors. To ensure that proper notice is given to the field, and follow-up is accomplished by vendors, reporting such issues to agencies like the US Food and Drug Administration (FDA), ISMP, or ECRI is critical (ISMP shares error reports with FDA). Government agencies such as the FDA and the Office of the National Coordinator for Health Information Technology need to have programs in place to learn from reporting programs and screen EHR software to prevent issues like this that could lead to a large-scale tragedy.

**Look-alike Menactra and MenQuadfi packages.** MENACTRA and MENQUADFI (meningococcal [groups A, C, Y, and W-135] conjugate vaccines) are approved for active immunization against invasive meningococcal disease caused by *Neisseria meningitidis* serogroups A, C, Y, and W-135. Both vaccines are manufactured by Sanofi Pasteur and have similar-looking carton and vial labels (**Figures 1** and **2**, page 4) but are not equivalent. Menactra is indicated for patients 9 months through 55 years old and contains 4 mcg of each meningococcal polysaccharide per 0.5 mL. MenQuadfi is indicated for patients 2 years or older (including patients over 55, the age limit for Menactra) and contains 10 mcg of each meningococcal polysaccharide per 0.5 mL. Both products have a purple column on the cartons' right side, and like all biological products, the proprietary (brand) name is printed below the nonproprietary (generic) name and does not stand out. Using the same product for all doses is recommended but not required.

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**ISMP What was the barcode scanning compliance rate in the perioperative setting at the start of implementation and what is it today?**

Dustin Although we had an entirely new EHR workflow in the perioperative setting, we achieved a scanning compliance rate of 84.5% (scanning medications prior to administration) and 87.6% (scanning patient identifiers) in operating and procedure rooms, preoperative holding areas, and PACUs during the first month of implementation in 2021. Our most recent measurement in June 2022 showed 93.5% compliance for the entire organization. That's including all personnel (including new and locum staff), medications without barcodes, and two EHR downtimes. If we exclude the few products without barcodes, our perioperative compliance rate for the entire organization is 96.2% for June (2022).

**ISMP Were there any unanticipated advantages to implementing barcode scanning technology in the perioperative setting?**

Dustin Yes, many. Besides capturing multiple close calls that would have otherwise reached the patient, we found that we had an increase in capturing charges in the perioperative setting, as medication charges now occurred upon administration. We also had better data and a grasp on what was actually being administered, for example, specific doses and volumes of medications. This enabled us to manage medication shortages and medication costs more effectively.

With the processes and conversion to a new EHR, there was a significant increase in the order volume entered for each patient. We found that standardizing the order sets resulted in more appropriate weight-based dosing of medications. There has also been a three-fold increase in perioperative order verification by pharmacists, as well as a significant reduction in perioperative ADC overrides.

Furthermore, implementing perioperative barcoding has presented us with a unique opportunity to collaborate with both surgeons as well as the internal medicine service physicians who provide a history and physical for perioperative patients and who may manage them postoperatively if they are admitted to the hospital. We established a general practice agreement with our orthopedic surgeons that allows for expansion of the collaboration.

Also, during preadmission testing visits, our pharmacists take the time to review all home medications and to speak with the patient regarding any discrepancies. Having an accurate medication history is important for many reasons, but for our organization, it is important especially for patients who will be admitted to the hospital postoperatively. On admission and in the PACU, medication reconciliation is planned by a pharmacist, mitigating potential problems with nonformulary items, proper conversion to an automatic therapeutic interchange, and avoiding duplicate or inappropriate therapy. Then the medication reconciliation is initiated by the internal medicine service physicians.

This admission medication reconciliation process was very successful, and the internal medicine service physicians requested that the service be continued at discharge, which has been accomplished. At discharge, a pharmacist conducts a medication reconciliation process, adding documentation for written prescriptions, monitoring, and hold parameters for patients, and providing discharge education so patients are prepared for a safe transition home. The internal medicine service physicians then review the plan and complete a final sign-off at discharge. Currently, pharmacists are looking to expand their general practice agreement to include anticoagulation bridging, pain management, insulin management, and hypertension management.

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When we reached out to Sanofi Pasteur to suggest differentiating these packages, they told us that Menactra will be phased out when the supply is fully depleted, which they anticipate will be mid-2022. For now, if your organization purchases both products, store these products separately and use barcode scanning to prevent dispensing and administration of the incorrect product.

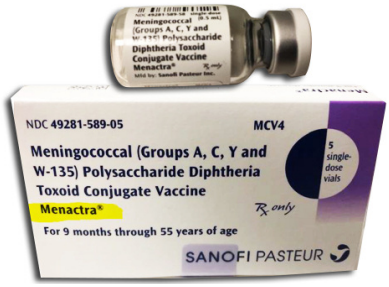


**Figure 1.** The Menactra carton and vial are prominently labeled as meningococcal polysaccharide diphtheria toxoid conjugate vaccine and are indicated for patients 9 months through 55 years old.

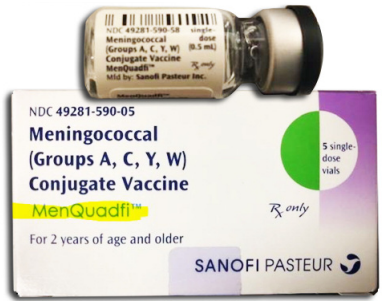


**Figure 2.** The MenQuadfi carton and vial are prominently labeled as meningococcal (groups A, C, Y, W) conjugate vaccine and are indicated for patients 2 years and older.

### "Shellfish allergy" may be a red herring.

Long-standing myths about allergy cross-reactivity with iodinated contrast media and shellfish, seafood, and iodine continue to impact patient care. Documented shellfish, seafood, and iodine allergies in an electronic health record (EHR) can lead to imaging delays or outright avoidance of imaging studies as well as unnecessary use of premedication(s). For example, an older survey of 231 physicians (Beaty AD, Lieberman PL, Slavin RG. Seafood allergy and radiocontrast media: are physicians propagating a myth? *Am J Med.* 2008;121[2]:158.e1-4) found that 65% of the radiologists and 89% of the cardiologists that responded (49%) asked about shellfish allergies prior to administering contrast agents. Thirty-five percent of the radiologists and 50% of the cardiologists

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If you would like more information from Dustin Carneal about implementing barcode scanning technology in the perioperative setting, you can email ISMP with your questions (ismpinfo@ismp.org), and we will forward your email to Dustin. For additional information on perioperative barcode scanning, please visit: www.ismp.org/node/31601 to review the new ***ISMP Guidelines for Safe Medication Use in Perioperative and Procedural Settings***. Please see announcements about the new perioperative guidelines on **pages 1** and **6.**

## Meet our three new 2022-2023 Fellows

**Tyler Nichols, PharmD, BCPS**, is the **2022-2023 ISMP International Medication Safety Management Fellow**, supported by Novartis, Name Creation & Regulatory Strategy. He completed his Doctor of Pharmacy degree at Albany College of Pharmacy and Health Sciences in Albany, NY. Prior to the fellowship, Tyler spent 12 years working in health-system pharmacy, most recently as an inpatient pharmacy manager with a focus on sterile compounding practices at the Albany Med Health System. Tyler hopes to use his time as an ISMP international fellow to gain a broader perspective on global safety initiatives and to work closely with subject matter experts across multiple organizations and disciplines to improve his ability to deliver safe and effective care.

**Jose P. Nery, PharmD**, is the **2022-2023 ISMP Safe Medication Management Fellow**, supported by Baxter International, Inc. He completed his Doctor of Pharmacy degree at the University of Pittsburgh School of Pharmacy in Pittsburgh, PA. Prior to the fellowship, Jose practiced as a Lead Pharmacist at the UPMC Children's Hospital of Pittsburgh, with primary oversight of medication error analysis. It is in this role that his passion for process improvement and medication safety was ignited. Jose's desire to gain mastery in the field of medication safety ultimately led him to pursue a fellowship with ISMP.

**Sadik Owolewa, PharmD**, is the **2022-2023 FDA/ISMP Safe Medication Management Fellow**. He completed his Doctor of Pharmacy at Northeastern University School of Pharmacy in Boston, MA. Before the fellowship, Sadik worked at a Rite Aid pharmacy as a staff pharmacist. It was while working in the retail pharmacy setting that he discovered his passion for medication safety, which led him to a fellowship role with ISMP. After his fellowship, Sadik hopes to use his skills in medication safety in a regulatory agency or in the pharmaceutical industry.

**If you would like to subscribe to this newsletter, visit: www.ismp.org/node/10**



**Report medication and vaccine errors to ISMP:** Please call 1-800-FAIL-SAF(E), or visit www.ismp.org/report-medication-error. ISMP guarantees the confidentiality of information received and respects the reporters' wishes regarding the level of detail included in publications.

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indicated they would hold contrast or premedicate patients who reported such an allergy.

Iodinated contrast media reactions are considered pseudoallergic or nonimmune-mediated anaphylactoid reactions attributed primarily to the osmolarity of the products (www.ismp.org/ext/966). On the other hand, allergies to shellfish, mollusks, and fish are reactions to proteins found in the food, not to the iodine content. In fact, iodine, an essential human nutrient required for the synthesis of thyroid hormones, cannot elicit an immune response and is often added to table salt across the globe to prevent iodine deficiency.

When patients tell you they have an allergy to shellfish, while it is important to document this in the EHR, you can assure them that they are at no greater risk for reactions from iodinated contrast media than are patients with other allergies. To learn more about identifying true patient risk factors and when it is appropriate to use premedications prior to contrast media, refer to the *2022 American College of Radiology (ACR) Manual On Contrast Media* (www.ismp.org/ext/960).

## Special Announcements

### MSOS Briefing

**MSOS members**: Please join us on **August 29, 2022**, at 3:00 pm ET for our next *MSOS Member Briefing* webinar, ***How "Smart" Are IV Smart Infusion Pumps?*** Two nursing researchers will discuss the expected and unexpected outcomes related to administering medications using smart infusion devices. For more information and to register, visit the MSOS website at: www.medsafetyofficer.org/.

### Nominations for Cheers Awards

Nominations for this year's **ISMP Cheers Awards** will be accepted through **September 9, 2022**. The **Cheers Awards** honor individuals, organizations, and groups that have demonstrated an exemplary commitment to medication safety. To submit a nomination, visit: www.ismp.org/node/123.

NEW

# ISMP Guidelines for Safe Medication Use in Perioperative and Procedural Settings

Hospitals, Ambulatory Surgery Centers (ASCs), and other surgical and procedural settings—use our new recommendations to help identify and mitigate risk!

ISMP's new guidelines:

- Address best practices associated with labeling of medications across all phases of perioperative and procedural care
- Challenge common practices that limit the protections offered by proven safety technologies, including smart infusion pumps
- Support the use of barcode scanning for real-time drug identification and electronic record documentation throughout perioperative and procedural care

**ALSO AVAILABLE:**

ISMP's Medication Safety Self Assessment® for Perioperative Settings:
ismp.org/node/18027

ISMP
Institute for Safe Medication Practices
An ECRI Affiliate

To access the guidelines, visit:
ismp.org/node/31601